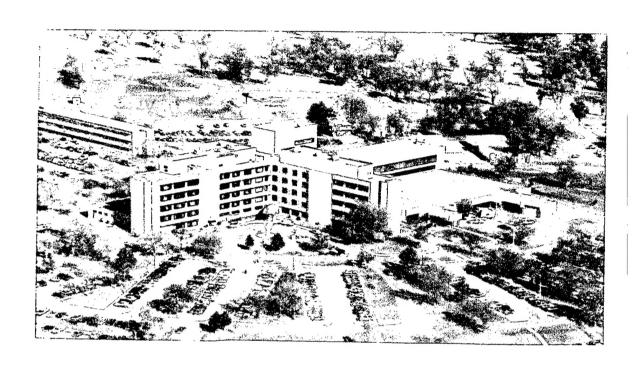
ENERGY ENGINEERING ANALYSIS PROGRAM

11-27A, Energy Surveys & Studies Destroy when no longer needed for current operations

FINAL SUBMITTAL



IRWIN ARMY COMMUNITY HOSPITAL FORT RILEY, KANSAS

PREPARED FOR

DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT
CORPS OF ENGINEERS
CONTRACT NO. DACA41-90-C-0114

PREPARED BY

MASSAGLIA.NEUSTROM.BREDSON, INC. CONSULTING ENGINEERS KANSAS CITY, MISSOURI

THE GAW COMPANY ARCHITECTS

VOLUME 3 OF 3
PROJECT DOCUMENTATION
JANUARY 1992

Received 6/11/92



DEPARTMENT OF THE ARMY

CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

REPLY TO ATTENTION OF:

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Marie Wakef**r**eld,

Librarian Engineering

INDEX

PROJECT #1

WINDOW/DOOR UPGRADE

PROJECT #2

HVAC MODIFICATIONS

PROJECT #3

BOILER CONTROLS

PROJECT #4

BOILER BURNERS/MODULAR BOILER

PROJECT #5

CHILLER REPLACEMENT



1. WINDOW / DOOR UPGRADE

1. COMPONENT
ARMY

FY 19 95 MILITARY CONSTRUCTION PROJECT DATA

19 APR 1992
14 APR 1992

3. INSTALLATION AND LOCATION
Fort Riley
Kansas

4. PROJECT TITLE
ECIP
Window/Door Upgrade & Light Rev.

5. PROGRAM ELEMENT 6. CATEGORY CODE 7. PROJECT NUMBER 8. PROJECT COST (\$000)

510 10 40475 230

9. COST ESTIMATES UNIT QUANTITY U/M ITEM COST (\$000) 184 PRIMARY FACILITY 1 183785 (814)EA Bldg 600 Mod 11 SUPPORTING FACILITIES (11)LS Design Cost 195 ESTIMATED CONTRACT COST 20 CONTINGENCY PERCENT (10.0%) 215 SUBTOTAL 13 SUPERVISION, INSPECTION & OVERHEAD (6.00%) (0)CATEGORY E EQUIPMENT 228 TOTAL REQUEST 230 TOTAL REQUEST (ROUNDED) (0)INSTALLED EQUIPMENT-OTHER APPROPRIATIONS

10. DESCRIPTION OF PROPOSED CONSTRUCTION

This project will include installing double pane tinted glass in Building 600 and Building 610 and installing 2 thick spandrel panels in Building 610. It includes extending the main entry vestibule in Building 600 and adjusting the door hold open time for the emergency entry vestibule. It also includes installing occupancy sensors in offices containing one or two four-lamp fixtures in the 1975 addition.

11. REQUIREMENT:

PROJECT:

Install double pane, tinted glass in Building 600 & 610. Renovate entry vestibules in Building 600 at main entrance and emergency entrance. Install wall mounted occupancy sensor light switches.

REQUIREMENT:

This project is required to reduce the gas and electrical consumption caused by excessive infiltration, high energy loss through single pane windows, and lights being left on when spaces are unoccupied.

DD FORM 1391

PREVIOUS EDITIONS MAY BE USED INTERNALLY UNTIL EXHAUSTED.

PAGE NO.

1 COMPONENT

ARMY

FY 19_95 MILITARY CONSTRUCTION PROJECT DATA

2. DATE

19 APR 1992 14 APR 1992

1 INSTALLATION AND LOCATION

Fort Riley

Kansas

4 PROJECT TITLE

ECTP

Window/Door Upgrade & Light Rev.

S, PROJECT NUMBER

40475

CURRENT SITUATION:

Building 610 and portions of Building 600 now have single pane, clear glass windows. Building 610 also has clear storm windows. Generally one-half of the storms are up and one-half of the storms are down. The main entry of the hospital is not long enough to prevent both sets of doors being open at the same time, allowing a large amount of outside air to infiltrate into the building. The emergency room vestibule doors must be open at the same time but the amount of time could be reduced. Offices are generally occupied 10 hrs/day. Lights are on the entire time, although occupancy fluctuates throughout the day.

IMPACT IF NOT PROVIDED:

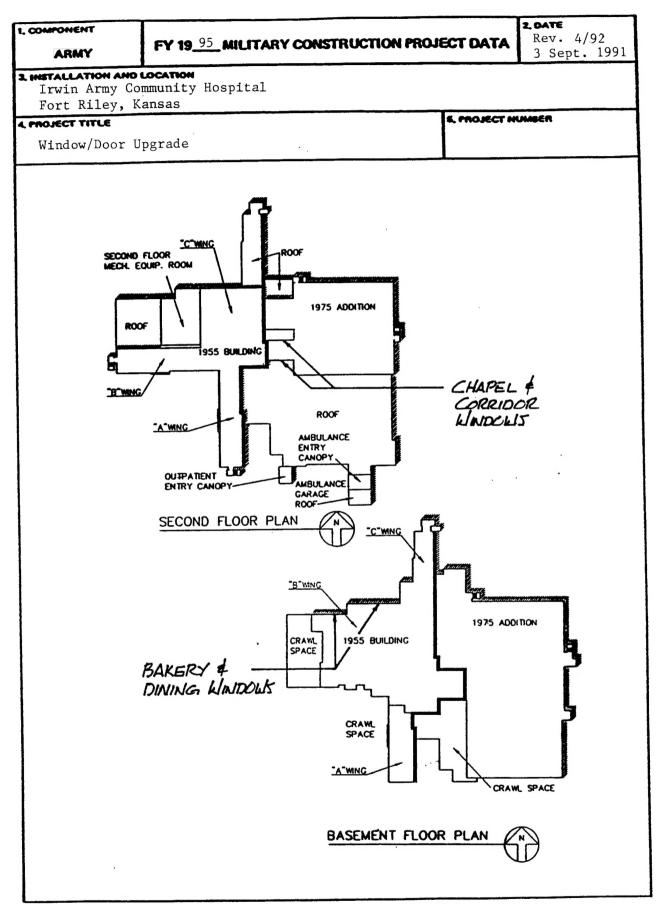
Failure to approve this project will result in the continued use of gas and electricity at a higher rate than necessary. It will also continue to inconvenience any handicapped user of the emergency room.

ADDITIONAL:

This project complies with the scope and design of CEHSU-FU-M, Energy Conservation Investment Program (ECIP) Guidance, that was in effect June 1991. The project has a Discounted Savings Ratio (SIR) of 1.64 and a simple payback of 9.94 years. The implementation of this project will provide an annual energy savings of 2990.5 MBTU and an annual dollar savings of \$20,443.

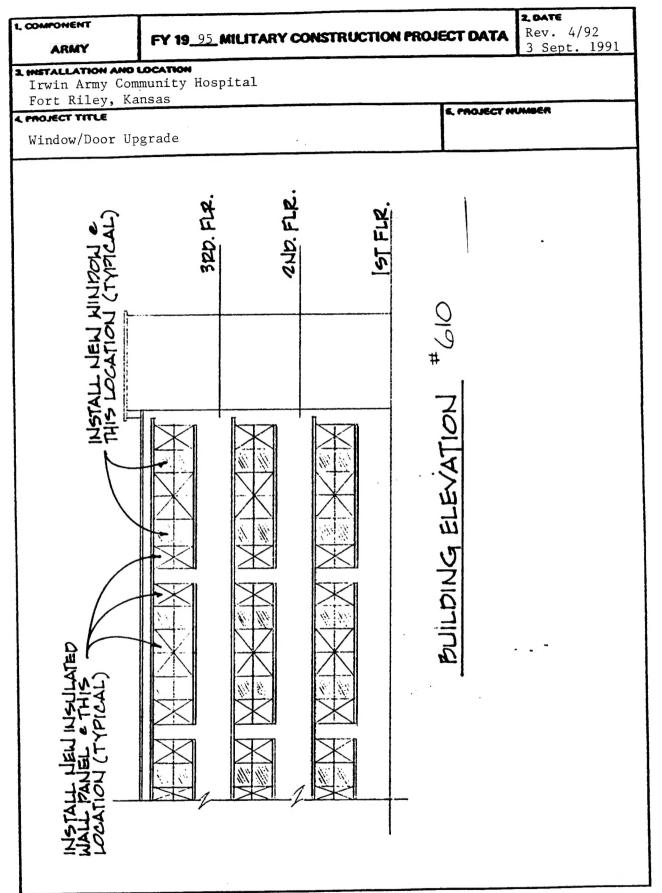
Project validation will be through metering of electric consumption at the hospital and electric and gas consumption at the Energy Plant, review of boiler operating logs, and engineering calculations.

ESTIMATED CONSTRUCTION START: APR 1995 INDEX: 1992 ESTIMATED MIDPOINT OF CONSTRUCTION: OCT 1995 INDEX: 2029 ESTIMATED CONSTRUCTION COMPLETION: APR 1996 INDEX: 2055



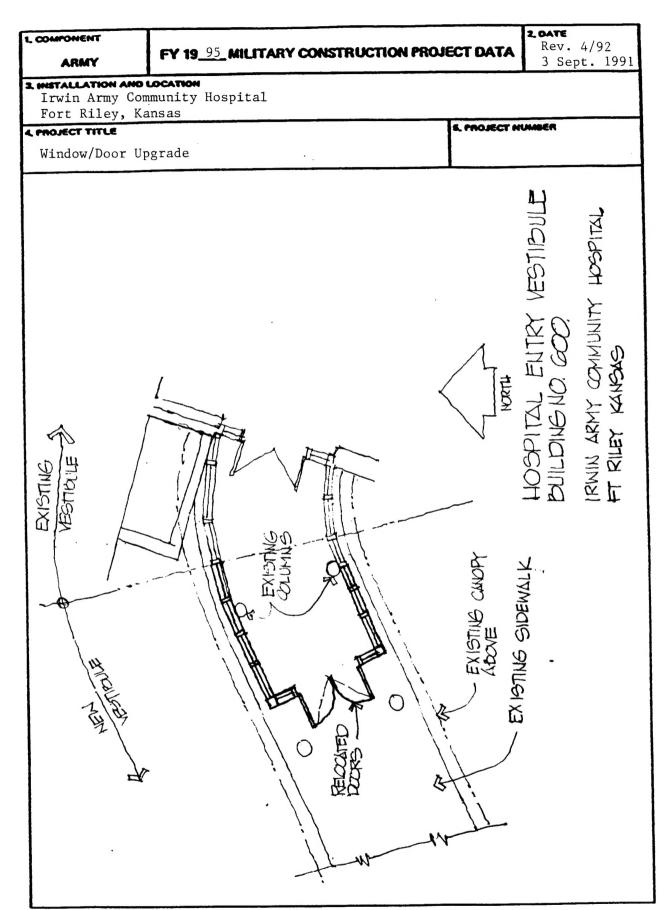
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PAGE NO.



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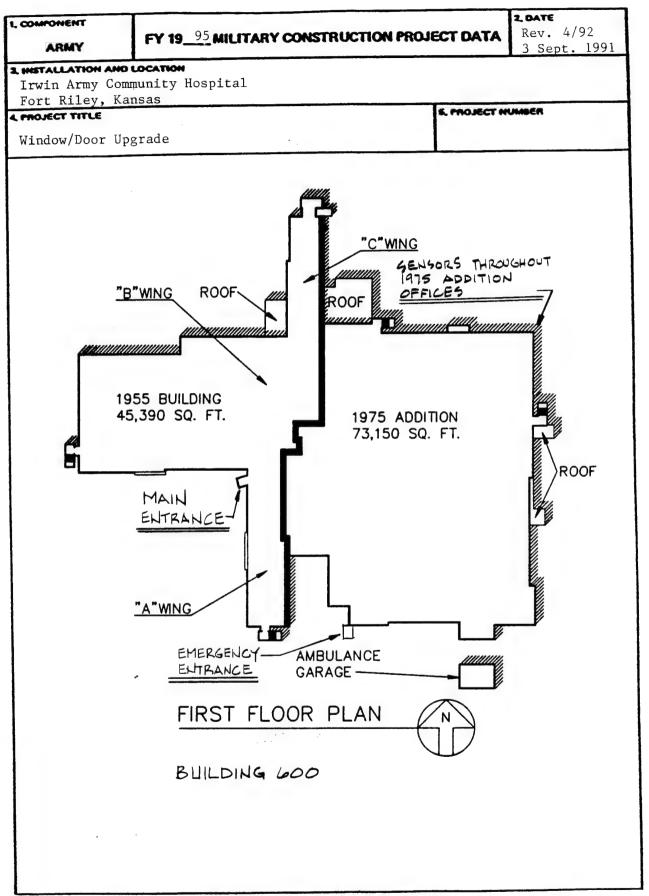
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PAGE NO.

COMPONENT	FY 1995 MILITARY CONSTRUCTION PROJECT DATA	2.DATE Rev. 4/92
ARMY		3 Sept. 1991
Trwin Army Co	LOCATION mmunity Hospital	
Fort Riley, K	ansas	
L PROJECT TITLE	S. PROJECT	(UNBER
Window/Door U	pgrade	
TYCH-E	EXECUTE SIDEMENT	RECOUNTED AUTO OPES INCL. SPREAMENTS LIEN KLIGL FREMENTS CALCO SUBSEP ALEN KLIGL FREMENTS CALCANDOS (2)

PAGE NO.

FOR OFFICIAL USE ONLY (WHEN DATA IS ENTERED)



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UNTIL EXHAUSTED

PAGE NO.

INTRODUCTION

There are existing single pane windows in the 1955 portion of Building 600 with no thermal break. They are located in the following areas:

- 1. Second floor connecting corridor to Mechanical Equipment Room.
- 2. Second floor Chapel windows.
- 3. Dining Rooms.
- 4. Bakery.

Replacement windows for these areas would be 1" tinted insulating glass set in bronze aluminum window units containing thermal breaks.

The existing single pane clear window units with storms in Building 610 are also being replaced as part of this project. Tinted 1" insulated glass will be installed in 101 windows and 2" insulated wall panels will be installed in the remaining 230 units.

Hospital entry vestibules at the main entry and the emergency/ outpatient entrance would be revised to create effective entry vestibules. The main entry vestibule was visited and field measured. An approximate 9'-0" wide curved hospital entry vestibule 6'-0" long on one side and 8'-0" long on the opposite side was added as part of the 1975 expansion and renovation project. The doors are medium styled, bronze anode, set in the original anodized window wall frame system. The vestibule does not provide adequate depth to ensure exterior doors are closed before interior doors are open and vice versa, especially when wheelchair bound persons use the entrance.

The emergency/outpatient entrance vestibules were surveyed and field measured. The existing emergency entry doors consist of two pair of 3'-0" and 7'-0" glass doors in aluminum frames spaced 19'-4" apart. The exterior doors swing inward and the exterior doors swing outward which reduces the effective vestibule length to 13'-4". The doors are automatic. They are activated by two ceiling mounted motion detectors per door. Exterior doors are recessed in 2'-8" from the covered canopy. Both sets of doors stand open for 10 seconds due to the emergency nature of the door traffic. The present vestibule could be extended by 5'-0" in conjunction with adjusting the door hold-open devices to reduce the time by a maximum of five seconds.

The existing outpatient doors were surveyed and found to be manually operated with a 12'-0" vestibule. While push-button control would be an improvement for handicapped patients, no energy is saved based on current operation of the doors; therefore, no savings are calculated.

The TRACE 600 program was used to model Building 600 and 610 as they now operate in T0045080 ALT 1 and T0015080 ALT 1. The building operation with new window units was then computed in file T0045080 ALT 2 and T0015080 ALT 2.

Manual calculations were performed to calculate the savings based on reduced infiltration through the vestibules.

The lights in the 1975 addition offices were surveyed and found to remain on when sporadically unoccupied during the day. The light switches in these spaces could be replaced with occupancy sensors to turn the lights off when the spaces are unoccupied. Manual calculations were performed to determine the amount of energy saved.

LIFE CYCLE COST ANALYSIS SUMMARY ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: FO PROJECT TITLE	rt Riley, Ks. : Window/Door TION NAME: Upg	REGION NO.: Upgrade & Ligh	7 nt Rev. FISCAL	PROJE YR.: 1995	CT NO.: 40475	
ANALYSIS DATE	4-15-92	ECONOMIC LIFE	25 YEARS	PREPA	RED BY: RDF	
1. INVESTMENT A. CONSTRU B. SIOH C. DESIGN C D. SALVAGE E. TOTAL INV	CTION COST	1B + 1C - 1D)	•••	\$ 181357 \$ 10882 \$ 10882 \$ 0	\$ 203121	
ANALYSIS DA		(-) NGS, UNIT COST SAVINGS MBTU/YR(2)	ANNUAL \$	SAVINGS DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)	
A. ELEC B. DIST C. RESID D. NG E. COAL	\$ 11.13 \$ 5 \$ 3.59	2035	\$ 10638 \$ \$ 7305	15.04	\$ 159996 \$ \$ 138203 \$	
F. TOTAL		2991	\$ 17943		\$ 298199	
A. ANNUAL RI (1) DISCOL	SAVINGS(+)/CO ECURRING (+/-) JNT FACTOR (TAI JNTED SAVING/C	BLE A)	14.68	\$ 2310 \$ 33911		
ITEM	RRING SAVINGS (YEAR OF	DISCOUNT FACTOR(3)	(+) CO: \$1 \$	856	
C. TOTAL NO	NENERGY DISCO	UNTED SAVINGS	(+) / COST (-) (3/	12+3BD4) \$3	5767	_
(1) 25% MA a. IF 31 b. IF 31 c. IF 31	AX NONENERGY (D1 IS = OR > 3C D1 IS < 3C CALC D1b IS = > 1 GO	GO TO ITEM 4 S1R = (2F5+3D	\$ 98406 01) / 1E =		u u	
4. FIRST YEAR D	OOLLAR SAVINGS	2F3+3A+(3B1d	/ YEARS ECONO	MIC LIFE) \$2	0443	
5. TOTAL NET D	ISCOUNTED SAV	INGS (2F5+3C)		\$ _33	3966	
6. DISCOUNTED	SAVINGS RATIO	(IF < 1 PROJEC	T DOES NOT QU	ALIFY) (SIR) =	(5/1E) = 1.64	4
7. SIMPLE PAYE	BACK PERIOD (ES	TIMATED YEARS	SPB = 1E/4		9.94	

THE TRACE GOO COMPUTER PROGRAM WAS USED TO MODEL THE HOSPITAL WITH THE EXISTING WINDOWS IN T\$\phi\$45080 ALT I. IN RUN T\$\phi\$45080, ALT 2, THE BUILDING ENVELOPE INPUT WAS MODIFIED TO REFLECT I-INCH TINTED, INSULATING GLASS IN ALUMINUM FRAMES WITH THERMAL BREAKS IN SECOND FLOOR CORRIDOR, SECOND FLOOR CHAPEL, DINING ROOM AND BAKERY AREAS. ELECTRICAL ENERGY AND GAS CONSUMPTION ARE REDUCED DUE TO THIS MODIFICATION.

ASSUMED CONDITIONS

PISTRICT PIPING LOSES = 10%

HEAT EXCHANGER EFFICIENCY = 80%

GAS COST = \$3.7/MCF

ELECT COST = \$0.038/KWH

MAINTENANCE COST DIFFERENCE WAS DETERMINED TO BE INSIGNIFICANT.

ANNUAL NONRECURRING COST FOR WINDOW REPLACEMENT DUE TO BREAKAGE AND RECAULKING WAS DETERMINED TO BE THE SAME FOR THE EXISTING WINDOWS AND PROPOSED MODIFICATION.

WINDOW "U" = 0.57, SHADING COEFFICIENT (SC) = 0.4

BASED ON OUTPUT FROM TRACE 600 THE ENERGY SAVINGS IS AS FOLLOWS.

ΤΦΦ 45080 ALT 1 KWH 8, 230, 699

ΤΦΦ 45080 ALT 2 KWH 8, 195, 004

35, 695 KWH

ΤΦΦ45080 ALT 1 MCF 23,651 ΤΦΦ45080 ALT 2 MCF 23,455 196 'XI. I PIPING: Q8 HX EH = 269.5 MCF

ANNUAL ENERGY SAVING 35,695 KWH x 3413 BTV KWH 269,5 MCF x 1.03 | x 106 BTV MCF

= 121.83 × 106 = 277.85 × 106 399.68 × 106 BTU/YR

35,695 KWH x 0.038 \$/KWH 269.5 MCF x 3.7 \$/MCF

= \$ 1356.41 = \$ 997.15 \$ 2353.56\$ YR

V 600

Trane Air Conditioning Economics

By: MASSAGLIA-NEUSTROM-BREDSON

By: MASSAGLIA-NEUSTROM-BREDSON

V 600

PAGE 1

THLY ENERGY CONSUMPTION - ALTERNATIVE 1

XISTING EQUIPMENT

	ELEC	DEMAND		
	On Peak	On Peak	GAS	WATER
Month	(kWh)	(kW)	(Therm)	(1000 Gl)
Jan	463,533	950	62,466	129
7eb	418,459	950	48,678	117
March	516,532	1,186	29,563	164
April	564,637	1,235	18,502	339
May	803,170	1,866	540	1,030
June	921,231	2,109	0	1,457
July	1,071,386	2,269	0	1,883
Aug	1,034,599	2,241	0	1,753
Sept	823,980	1,978	198	1,164
Oct	612,446	1,274	14,442	442
Nov	499,557	1,179	30,922	151
Dec	501,171	1,166	38,531	144
Total	8,230,699	2,269	243,842	8,775

Building Energy Consumption =

164,830 (Btu/Sq Ft/Year)

318,361 (Sq Pt) Floor Area =

Source Energy Consumption = 345,363 (Btu/Sq Ft/Year)

ECO 5 NEW WINDOWS IN BAKE, DINE, CHAPEL

 - MONTHLY	ENERGY C	CONSUMPTION -

	ELEC	DEMAND		
	On Peak	On Peak	GAS	WATER
Month	(kWh)	(kW)	(Therm)	(1000 GL)
Jan	460,891	947	62,204	129
Feb	416,081	947	48,493	117
March	514,365	1,181	29,355	166
April	562,402	1,230	18,273	340
May	798,135	1,859	540	1,024
June	918,189	2,099	0	1,456
July	1,065,662	2,263	0	1,872
Aug	1,030,509	2,233	0	1,748
Sept	820,499	1,970	198	1,161
Oct	607,806	1,269	13,718	436
Nov	513,609	1,175	30,830	155
Dec	486,855	1,162	38,216	148
Total	8,195,004	2,263	241,826	8,751

Building Energy Consumption = Source Energy Consumption = 163,815 (Btu/Sq Ft/Year)

343,548 (Btu/Sq Ft/Year)

Floor Area =

318,361 (Sq Ft)

FROJECT Irwin Army Community Hospital LOCATION Fort Riley, Kansas TASK DESCRIPTION NO. OF							January	1992		Apr11 1992	199.2	
iley, Kansas sk Description	tal - EEAP	AP		CODE /Check one) X A B	heck one)	٥	DRAWING NO.	Ġ		SHEET	0.5	3 SHEETS
1				<u> </u>	ОТНЕЯ		ESTIMATOR			CHECKED BY	Frvmfre	•
	QUANTITY			LABOR		EQ	EQUIPMENT	Š	MATERIAL		ŝ	SHIPPING
	NO. OF UNIT	T MH	TOTAL	PRICE	COST	UNIT	COST	PRICE	COST	TOTAL	TIND	TOTAL
KINDOM	PEPLA	PLACEME	NT	FOR	BUILDING	ING	000					
SHEET 2 OF 5					•					7142		
SHEET 3 OF 5										414		
SHEET 4 OF 5										4004		
SHEET 5 OF 5						br.				2092		
SUBTOTAL										17891		
CONTRACTOR OH @ 15	1590									7684		
SUISTOTAL									,	20575		
CONTRACTOR PEDFIT & 10%	1090									7502		
SUBTOTAL									1	12632		
CONTINGENCIES @ 5	5.5 70			_						12.45		
CONSTRUCTION COST										23817		
510H @ 6.0%										1433		
TOTAL THIS SHEET												

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	ANALYSIS	gency is	USACE.	I V	INVITATION/CONTRACTOR	ACTOR	EFFECTIVE PRICING DATE January 1992	RICING DA	ATE	DATE PREPARED	160	
PROJECT Irwin Army Community Hospital	ital - EEAP	4.P		00 ×	CODE (Check one)	ع ا	DHAWING NO.			SHEET 2	9 50	SHEETS
LOCATION Fort Rilev, Kansas				J L] Land]	ESTIMATOR			12	The state of the s	
	QUANTITY			LABOR		EO	EQUIPMENT	Ň	MATERIAL		17 11 17 1	SHIPPING
TASK DESCRIPTION	NO. OF UNIT	ž	TOTAL	L UNIT	T COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL
SECOND FLUOR	CORRID	RIDOR										
REMOVE EXISTING			1									
67												
MINDOM SECTION												
TOTAL OF 3 SECT.	225 SF	-		- a3	012 8	1				012		
INSTALL NEW BRONZE	,,,					-						
TINTED MINDOMS/M												
THERMAL BREAK &												
I-INCH INSULATING												
4LASS	45 522	,		4.0	5 1083			25.2	5670	6753		
CAULK NEW KINDOWS	150 LF	,,		1.0	152			0.19	27	179		
TOTAL THIS SHEET										7142		
DA FORM 5418-R. Apr 26												

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	E ANALY	SIS ent agent	y Is USAC		INVITATI	INVITATION/CONTRACTOR		EFFECTIVE PRICING DATE January 1992	PRICING D	ATE	DATE PREPARED April 1992	96 0	
PROJECT Irwin Army Community Hospital	pital –	EEAP			CODE (Check one)	eck one)	ů	DRAWING NO.	o.		SHEET 3	o. 55	SHEETS
LOCATION Fort Riley, Kansas						ОТНЕЯ		ESTIMATOR			CHECKED BY	Fromfre	
	QUANTITY	П			LABOR		EOL	EQUIPMENT	ž	MATERIAL		SHIR	SHIPPING
TASK DESCRIPTION	NO. OF UNITS	MEAS	MH UNIT	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TIM	TOTAL
SECOND FLOOR C	CHAPEL	Z	MINDOWS	15									
REMOVE EXISTING													
1"0-02 × H"2-3													
SECTION OF ALLIM													
MINDOMS	30	28	1	ı	6.	121					121		
INSTALL NEKI BRONEE	1.1												
TINTED MINDOLIS/W													
THEEMAL BREAK 4													
I-INCH INSULATING													
61455	130	SF	1	I	4.81	679			25.2	32.76	1068		
CAULK NEW WINDOWS	00	7	ı	١	<u>-</u>	10	I		0.18	18	<u>=</u>		
TOTAL THIS SHEET											14/4		

DA FORM S416-R, Apr 86

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	FE ANALYS	IS nt agenc	V Is USACI		INVITATI	INVITATION/CONTRACTOR	STOR	EFFECTIVE PRICING DATE January 1992	RICING D.	ATE	DATE PREPARED April 1992	я є р	
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)	eck one)	۲	DRAWING NO.	·		SHEET 4	0 40	S SHEETS
Z F] []	1	ESTIMATOR			0		1
FOLC ALLEY, Nameds	QUANTITY	17.		7	LABOR	ОТНЕЯ	EQ	EQUIPMENT	Σ	MATERIAL	R. D.	Frymire	re
TASK DESCRIPTION	NO. OF UNITE N	MEAS	TINO	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	T.W.	TOTAL
DINING ROOM MINDOMS	OMS												
CEMOVE EXISTING													
8-9"4 × 19-6"L Pro													
STEEL FRAME WINDOWS	<u>n</u>	EA	-		25	1	ļ				305		
INSTALL NEW BEONEE													
MINDON UNITS M													
THEEMAN BREAK &													
1-INCH TINTED													
INSULATING GLASS	5	EA	1		39	468	1		052	3000	3468		
CAULK NEW MINDOKS 200	200	77			1.01	202			0.10	36	238		
TOTAL THIS SHEET											4004		
DA FORM S418-R, Apr 86													

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	TE ANAL	YSIS nent agen	y le USAC		INVITAT	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE January 1992	IVE PRICING DATI	АТЕ 92	DATE PREPARED April 1992	чер 1992	
PROJECT Irwin Army Community Hospital	pital -	- EEAP			CODE (Check one)	eck one)	۲	DRAWING NO.			SHEET 5	9	SHEETS
LOCATION Fort Rilev. Kansas]	1	ESTIMATOR			CHECKED BY	1	
	AND	QUANTITY			LABOR		EOL	EQUIPMENT	Š	MATERIAL	1	INS SHI	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH	TOTAL	PRICE	COST	PRICE	cost	PRICE	COST	TOTAL	T.Y.	TOTAL
BAKERY KIINDOMS	.0												
REMOVE 3-6"x 16-0"						•							
FIXED SASH PAINTED													
STEEL MINDOM UNITS	a	EA	1	1	62				1		202		
INSTALL NEW BRONZE													
ALLIM. KINDOM UNITS													
W/THERMAL BREAK &													
1-INCH TINTED													
INSULATING GLASS	a	EA			39	312			052	2000	2312		
CAULK NEW WINDOWS	25	7			1.0	76			0.10	4	96		
					_								
TOTAL THIS SHEET											2092	L	

19

DA FORM 5418-R, Apr 85

TRACE 600 PROGRAM WAS USED TO MODEL THE NURSE QUARTERS. THE BUILDING ENVELOPE INPUT WAS CHANGED TO REFLECT THE REPLACEMENT OF 238 WINDOW UNITS WITH 2-INCH THICK PORCELEAN FINISHED INSULATING PANELS AND 101 WINDOW UNITS WITH BRONZE TINTED DOUBLE HUNG ALUMINUM WINDOWS WITH THERMAL BREAK AND 1-INCH INSULATING GLASS. ELECTRICAL ENERGY AND GAS CONSUMPTION FOR THE BUILDING ARE REPUCED DUE TO THIS MODIFICATION.

ASSUMED CONDITIONS

DISTRICT PIPING LOSES = 10%
HEAT EXCHANGER EFFICIENCY = 80%
GAS COST = \$3.7/MCF
ELECT COST = \$0.038/KWH

MAINTENANCE COST DIFFERENCE WAS BASED ON AREA OF WINDOW TO BE WASHED.

ANNUAL NONRECURRING COST FOR WINDOW REPLACEMENT DUE TO BREAKAGE WAS DETERMINED TO BE THE SAME FOR BOTH WINDOW SYSTEMS. WINDOW CAHLKING WAS BASED ON 25 YEAR LIFE. WINDOW """ = 0.57, S.C. = 0.36

DIFFERENCE IN ENERGY CONSUMPTION

BASE RUN TOO 15080 ALT 1 ANNUAL KHH = 451,097

NEW WINDOWS TOO 15080 ALT 2 ANNUAL KHH = 311,580

139,517

BASE RUN ANNUAL MCF = $622.99 \times 1.1 \div 0.8 = 856.61$ TOO15080 ALT 2 MCF = $319.01 \times 1.1 \div 0.8 = 438.6$ 417.97 ANNUAL ENERGY SAYINGS
139, 517 KWH x 3413 BTU/KWH = 476.17 x 106
417.97 MCF x 1.031 x 106 BTU/MCF = 430.93 x 106
907.10 x 106 BTU/YE

ANNUAL DOLLAR SAVINGS
139, 517 KHH X \$ 0.038/KHH = \$ 5301.65
417.97 MCF x \$ 3.70/ MCF = \$ 1546.50
\$ 6848.15/YR

ANNUAL RECURRING MAINTENANCE FOR WINDOW WASHING EXISTING WINDOWS: $5025 \text{ SF} \div 400 \text{ SF/MHR} \times $^{4}17.50/\text{MHR} \times 2 = $^{4}445/\text{YR}$ NEW WINDOWS: $1515 \text{ SF} \div 400 \text{ SF/MHR} \times $^{4}17.50/\text{MHR} \times 2 = $^{4}133/\text{YR}$ $\text{SAVINGS} = $^{4}312/\text{YR}$

NONRECURRING MAINTENANCE FOR WINDOW CAULKING EXISTING WINDOW SYSTEM WILL REQUIRE CAULKING PEPLACEMENT IN YEAR 21 OF THE 25 YEAR STUDY LIFE ASSUMING 25 YEAR CAULK, COST OF WINDOW CAULKING AS INDICATED IN COST ESTIMATE: 4000 LF x # 1.19/LF = # 4760.00

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 1

EXISTING EQUIPMENT

------ MONTHLY ENERGY CONSUMPTION -----

	ELEC	DEMAND	
	On Peak	On Peak	STEAM
Month	(kWh)	(kW)	(Therm)
Jan	28,898	42	2,558
Feb	26,057	42	1,583
March	28,578	42	501
April	27,513	42	90
May	37,489	126	0
June	50,292	162	0
July	65,793	187	0
Aug	60,238	179	0
Sept	41,238	141	0
Oct	28,454	42	65
Nov	27,775	42	584
Dec	28,775	42	1,041
Total	451,097	187	6,423

Building Energy Consumption =
Source Energy Consumption =

84,394 (Btu/Sq Ft/Year) 211,792 (Btu/Sq Ft/Year) Floor Area =

25,854 (Sq Ft)

Date: January

TOTAL ENERGY - KV	∤H	28,898			
BILLING CAPACITY	- KVA	42			
CAPACITY CHARGE					
(200) First					\$186.90
(400) Next				Capacity @ \$4.25 =	
Additional		0	KVA of Billing	Capacity @ \$4.05 =	\$0.00
			-		
TOTAL KVA		42			\$186.90
Ownership (Y/N)?	Y	Less Substati	_	scount a \$.20/KVA =	: (\$8.40
					\$178.50
ENERGY CHARGE					
				\$78.25	
				\$134.65	
				\$303.03	
EXCESS	=	12,098		\$322.53	
TOTAL KVA		28,898		\$838.46	
Capacity Charge		\$178.50			
Energy Charge		\$838.46			
Total Capacity					
and Energy		\$1,016.96			
Subtotal		\$0.00			
City Revenue Char	ge	\$0.00			
Subtotal	•	\$0.00			
KRST Exempt 100.	.00%	\$0.00			
LRST Exempt 100.	.00%	\$0.00			
Subtotal		\$0.00			
Other Charges	•	\$0.00			
			-		
TOTAL AMOUNT DUE		\$1,016.96			
			•		

Date: February

TOTAL ENERGY - KWH		26,057					
BILLING CAPACITY -	KVA	42					
CADACITY CHARCE							
CAPACITY CHARGE (200) First		42	KVA of Ri	lling Ca	pacity a	\$4.45 =	\$186.90
(400) Next					pacity a		
Additional					pacity a		\$0.00
TOTAL KVA		42					\$186.90
Ownership (Y/N)?	Y Le	ess Substatio	n Ownersh	ip Disco	unt @ \$.2	20/KVA =	(\$8.40)
							\$178.50
ENERGY CHARGE	_					-	
50 x 4							
100 x 4							
250 x 4		-					
EXCESS		9,257	K₩H a 0.0	· -		246.79	
TOTAL KVA		26,057				762.72	
				-			
Capacity Charge		\$178.50					
Energy Charge		\$762.72					
Total Capacity							
and Energy		\$941.22					
Subtotal		\$0.00					
City Revenue Charg	e	\$0.00					
Subtotal		\$0.00					
KRST Exempt 100.0	0%	\$0.00					
LRST Exempt 100.0	0%	\$0.00					
Subtotal		\$0.00					
Other Charges		\$0.00					
TOTAL AMOUNT DUE		\$941.22					

Date: March

TOTAL ENERGY - KW	Н	28,578				
BILLING CAPACITY	- KVA	42				
CAPACITY CHARGE			•			
(200) First		42	KVA of Billing	Capacity & \$4	.45 =	\$186.90
(400) Next			KVA of Billing			
Additional		0	KVA of Billing	Capacity a \$4	.05 =	\$0.00
TOTAL KVA		42	-		•	#194 DD
IUIAL KVA		42				\$186.90
Ownership (Y/N)?	Y	Less Substati	on Ownership Di	scount @ \$.20/	KVA =	(\$8.40
ENERGY CHARGE						\$178.50
ENERGY CHARGE	(2 -	2 100	KWH a 0.03726	- ¢7	g 25	
			KWH a 0.03206			
			KWH a 0.02886			
EXCESS		•	KWH @ 0.02666		4.00	
LACEGO				- +51		
TOTAL KVA		28,578		\$82	9.93	
Capacity Charge		\$178.50				
Energy Charge		\$829.93				
Total Capacity			•			
and Energy		\$1,008.43				
Subtotal		\$0.00				
City Revenue Charg	ge	\$0.00				
Subtotal		\$0.00				
KRST Exempt 100.0	00%	\$0.00				
LRST Exempt 100.0	00%	\$0.00				
Subtotal		\$0.00				
Other Charges	•	\$0.00				
TOTAL AMOUNT DUE		\$1,008.43				

Date: April

TOTAL ENERGY - K	WH	27,513				
BILLING CAPACITY	- KVA	42				
CAPACITY CHARGE						
(200) First					ity a \$4.45 =	
(400) Next					ity @ \$4.25 =	
Additional		0		lling Capac	ity a \$4.05 =	\$0.00
TOTAL KVA		42				\$186.90
Ownership (Y/N)?	Y			ip Discount	a \$.20/KVA =	(\$8.40
						\$178.50
ENERGY CHARGE					470.05	
50 x	42 =		KWH @ 0.03	5726 =	\$78.25	
	42 =	4,200	KWH @ 0.03	3206 =	\$134.65	
250 x	42 =	10,500	KWH @ 0.02	2886 =		
EXCESS	=	10,713	KWH a 0.02		\$285.61	
TOTAL KVA		27,513			\$801.54	
Capacity Charge		\$178.50				
Energy Charge		\$801.54				
Total Capacity		•••••	•			
and Energy		\$980.04				
Subtotal		\$0.00				
City Revenue Cha	rge	\$0.00				
Subtotal	• •	\$0.00				
KRST Exempt 100	.00%	\$0.00				
LRST Exempt 100	.00%	\$0.00				
Subtotal		\$0.00				
Other Charges	••	\$0.00				
			•			
TOTAL AMOUNT DUE		\$980.04				

Date: May

TOTAL ENERGY - KW	H	37,489					
BILLING CAPACITY	- KVA	126					
••••							•••••
CAPACITY CHARGE							
(200) First		126	KVA	of Billin	g Capacity	a \$4.45 =	\$560.70
(400) Next		0	KVA	of Billin	g Capacity	a \$4.25 =	\$0.00
Additional		0	KVA	of Billin	g Capacity	a \$4.05 =	\$0.00
TOTAL KVA		126					\$560.70
Ownership (Y/N)?	Y			nership D	iscount a s	.20/KVA =	(\$25.20
ENERGY OUTROS							\$535.50
ENERGY CHARGE	24 -	4 700	NTIN .	a n n zz z	_	¢27/- 7/	
		6,300 12,600					
		18,589					
EXCESS					=		
EXCESS	-			u 0.02000		30.00	
TOTAL KVA		37,489				1,175.17	
Capacity Charge		\$535.50					
Energy Charge		\$1,175.17					
Total Capacity							
and Energy		\$1,710.67					
Subtotal		\$0.00					
City Revenue Char	ge	\$0.00					
Subtotal		\$0.00					
KRST Exempt 100.		\$0.00					
LRST Exempt 100.	00%	\$0.00					
Subtotal		\$0.00					
Other Charges	•	\$0.00					
TOTAL AMOUNT DUE		\$1,710.67					
			•				

Date: June

TOTAL ENERGY -	K.WH	50,292					
BILLING CAPACIT	Y - KVA	162					
CAPACITY CHARGE							
(200) First						9 \$4.45 =	\$720.90
(400) Next		0	KVA of	Billing	Capacity 8	\$4.25 =	\$0.00
Additional				Billing	Capacity 6	\$4.05 =	\$0.00
						-	
TOTAL KVA		162					\$720.90
Ownership (Y/N)	? Y			rship Dis	count a \$.20/KVA =	(\$32.40
							\$688.50
ENERGY CHARGE	4/2 -	9 400	ин ^	0 07724 -			
		8,100	KWH a	0.037204 =		\$519.37	
100 x							
EXCESS	=	25,992		0.02666 =		\$0.00	
EXCE35	-			0.02000 -			
TOTAL KVA		50,292				1,571.31	
Capacity Charge		\$688.50					
Energy Charge		\$1,571.31					
Total Capacity							
and Energy		\$2,259.81					
Subtotal		\$0.00					
City Revenue Ch	arge	\$0.00					
Subtotal		\$0.00					
KRST Exempt 10	0.00%	\$0.00					
LRST Exempt 100		\$0.00					
Subtotal		\$0.00					
Other Charges .		\$0.00					
	-	£2 250 81					
TOTAL AMOUNT DU	=	\$2,259.81					

Date: July

TOTAL ENERGY -	KWH	65,793				
BILLING CAPACIT		187				
CAPACITY CHARGE						
(200) First		187	KVA (of Billing C	anacity 2 \$ 4 45 =	\$832.15
(400) Next					apacity @ \$4.25 =	
Additional					apacity @ \$4.05 =	
					, , , , , , , , , , , , , , , , , , , ,	
TOTAL KVA		187				\$832.15
Ownership (Y/N)	? Y			nership Disco	ount @ \$.20/KVA =	(\$37.40
ENERGY CHARGE						\$794.75
ENERGY CHARGE	197 -	0.750	MIN 4	0 03724 -	e7/9 70	
					\$348.38 \$599.52	
					\$1,089.26	
	=				\$0.00	
ENGEGG						
TOTAL KVA		65,793			\$2,037.17	
				-		
•••••						
Capacity Charge		\$794.75				
Energy Charge		\$2,037.17				
Total Capacity			•			
and Energy		\$2,831.92				
Subtotal		\$0.00				
City Revenue Cha	arge	\$0.00				
Subtotal		\$0.00				
KRST Exempt 100	0.00%	\$0.00				
LRST Exempt 100	0.00%	\$0.00				
Subtotal		\$0.00				
Other Charges	•••	\$0.00				
TOTAL AMOUNT DUE	=	\$2,831.92				
. S.AE ANOUNT DOL		42,001.72				

Date: August

TOTAL ENERGY - KWH		60,238					
BILLING CAPACITY -	KVA	179					
CAPACITY CHARGE							
(200) First		179	KVA of Billing	Capacity	a \$4.45 =	\$79	6.55
(400) Next		0	KVA of Billing	Capacity	a \$4.25 =	\$	0.00
Additional		0	KVA of Billing	Capacity			0.00
			•				
TOTAL KVA		179				\$79	6.55
Ownership (Y/N)?		s Substatio		scount a :	\$.20/KVA =	(\$3	5.80
						\$76	0.75
ENERGY CHARGE							
			KWH @ 0.03726				
			KWH @ 0.03206				
			KWH @ 0.02886				
EXCESS			KWH @ 0.02666		\$0.00		
TOTAL 10/A		60,238			\$1,870.93		
TOTAL KVA							
Capacity Charge							
Energy Charge		\$1,870.93					
Total Capacity			•				
and Energy		\$2,631.68					
Subtotal		\$0.00					
City Revenue Charg	e	\$0.00					
Subtotal		\$0.00					
KRST Exempt 100.0	0%	\$0.00					
LRST Exempt 100.0	0%	\$0.00					
Subtotal		\$0.00					
Other Charges		\$0.00					
TOTAL AMOUNT DUE		\$2,631.68					
IUIAL AMOUNI DUE		\$2,051.00					

Date: September

TOTAL ENERGY - KWH	41,238			
BILLING CAPACITY - KV				
		• • • • • • • • • • • • • • • • • • • •		
CAPACITY CHARGE (200) First	1/.1	KVA of Rilling Capa	city 2 \$/ /5 =	\$ 627.45
(400) Next	141	KVA of Billing Capac KVA of Billing Capac	city @ \$4.45 =	\$0.00
Additional		KVA of Billing Capa		
		-		
TOTAL KVA	141			\$627.45
Ownership (Y/N)? Y			t a \$. 20/KVA =	(\$28.20)
				\$599.25
ENERGY CHARGE				
50 x 141 =	7,050	KWH @ 0.03726 =	\$262.68	
100 x 141 =	•	KWH @ 0.03206 =		
250 x =	•	KWH @ 0.02886 =		
EXCESS =	0	KWH @ 0.02666 =	\$0.00	
TOTAL KVA			\$1,294.47	
TOTAL KVA	41,230		#1,274.41	
Capacity Charge	\$599.25			
Energy Charge	\$1,294.47			
Total Capacity		•		
and Energy	\$1,893.72			
Subtotal	\$0.00			
City Revenue Charge	\$0.00			
Subtotal	\$0.00			
KRST Exempt 100.00%	\$0.00			
LRST Exempt 100.00%	\$0.00			
Subtotal	\$0.00			
Other Charges	\$0.00			
TOTAL AMOUNT DUE	\$1,893.72			

Date: October

TOTAL ENERGY - K	WH	28,454					
BILLING CAPACITY	- KVA	42					
CAPACITY CHARGE		43	VVA	of Billin	g Capacity	a \$ 4 45 =	\$186.90
(200) First (400) Next					g Capacity		\$0.00
Additional					g Capacity		\$0.00
TOTAL KVA		42					\$186.90
Ownership (Y/N)?	Y			mership D	iscount a 1	.20/KVA =	(\$8.40
							\$178.50
ENERGY CHARGE			10.00		_		
		2,100					
		4,200					
		10,500 11,654					
EXCESS	_	11,034		a 0.02000			
TOTAL KVA		28,454				\$826.62	
Capacity Charge		\$178.50					
Energy Charge		\$826.62					
Total Capacity							
and Energy		\$1,005.12					
Subtotal		\$0.00					
City Revenue Cha	rge	\$0.00					
Subtotal		\$0.00					
KRST Exempt 100	.00%	\$0.00					
LRST Exempt 100		\$0.00					
Subtotal		\$0.00					
Other Charges		\$0.00					
TOTAL AMOUNT DUE		\$1,005.12					

Date: November

TOTAL ENERGY	- KWH	27,775			
BILLING CAPAC					
			• • • • • • • • • • • • • • • • • • • •	••••	
CAPACITY CHAR	GE				
(200) First				acity a \$4.45 =	
(400) Next			KVA of Billing Cape	-	\$0.00
Additional		0	KVA of Billing Cape -	•	\$0.00
TOTAL KVA		42			\$186.90
Ownership (Y/I	N)? Y			nt @ \$.20/KVA =	(\$8.40
					\$178.50
ENERGY CHARGE		2 122			
			KWH @ 0.03726 = KWH @ 0.03206 =		
			KWH @ 0.02886 =		
EXCESS	=	10,975	KWH @ 0.02666 =	\$292.59	
TOTAL KVA		27,775		\$808.52	
Capacity Char	ge	\$178.50			
Energy Charge		\$808.52			
Total Capacity	/		•		
and Energy		\$987.02			
Subtotal		\$0.00			
City Revenue (Charge	\$0.00			
Subtotal		\$0.00			
KRST Exempt	100.00%	\$0.00			
LRST Exempt	100.00%	\$0.00			
Subtotal		\$0.00			
	••••	\$0.00			
Other Charges					
Other Charges			-		
Other Charges	DUE	\$987.02	-		

Date: December

TOTAL ENERGY - KW	H	28,775					
BILLING CAPACITY	- KVA	42					
CAPACITY CHARGE							
(200) First		42	KVA	of Billing	Capac	ity a \$ 4.45 =	\$186.90
(400) Next		0	KVA	of Billing	Capac	ity a \$4.25 ≖	\$0.00
Additional				of Billing	Capac	ity @ \$4.05 =	\$0.00
TOTAL KVA		42					\$186.90
Ownership (Y/N)?	Y	Less Substati		nership D	iscount	@ \$.20/KVA =	(\$8.40
							\$178.50
ENERGY CHARGE							
50 x	42 =	2,100	KWH	a 0.03726	=	\$78.25	
100 x	42 =	4,200	KWH	a 0.03206	=	\$134.65	
250 x						\$303.03	
EXCESS	=	11,975		a 0.02666		\$319.25	
TOTAL KVA		28,775				\$835.18	
Capacity Charge		\$178.50					
Energy Charge		\$835.18					
Total Capacity			•				
and Energy		\$1,013.68					
Subtotal		\$0.00					
City Revenue Char	ge	\$0.00					
Subtotal		\$0.00					
KRST Exempt 100.	00%	\$0.00					
LRST Exempt 100.0	00%	\$0.00					
Subtotal		\$0.00					
Other Charges	•	\$0.00					
TOTAL AMOUNT DUE		\$1,013.68	•				
TOTAL ALLOWED DOL		2.,0.0.00					

Trane Air Conditioning Economics BY: MASSAGLIA-NEUSTROM-BREDSON

NTHLY ENERGY CONSUMPTION - ALTERNATIVE 2

ECO 29 REDUCE WINDOW AREA

------ MONTHLY ENERGY CONSUMPTION -----

	ELEC	DEMAND	
	On Peak	On Peak	STEAM
Month	(kWh)	(kW)	(Therm)
Jan	21,446	32	1,436
Feb	19,370	32	897
March	21,206	32	181
April	20,243	32	13
May	25,151	67	0
June	32,977	85	0
July	41,782	95	0
Aug	38,848	93	0
Sept	27,673	76	0
0ct	20,894	32	6
Nov	20,591	32	263
Dec	21,398	32	493
Total	311,580	95	3,289

Building Energy Consumption = Source Energy Consumption =

53,853 (Btu/Sq Ft/Year) 140,369 (Btu/Sq Ft/Year)

Floor Area = 25,854 (Sq Ft)

35

Date: January

TOTAL ENERGY - K	CWH .	21,446			
BILLING CAPACITY					
CAPACITY CHARGE					
(200) First		32	KVA of Rilling Car	pacity @ \$4.45 =	\$142.40
(400) Next			KVA of Billing Cap		\$0.00
Additional			KVA of Billing Cap		\$0.00
					\$142.40
TOTAL KVA		32			\$142.40
Ownership (Y/N)?	Y	Less Substatio	on Ownership Disco	unt @ \$.20/KVA =	(\$6.40)
					\$136.00
ENERGY CHARGE	72 -	4 400	ин э о отта		
			KWH @ 0.03726 =		
			KWH a 0.03206 =		
			KWH a 0.02886 = KWH a 0.02666 =		
EXCE22	-	8,040		***************************************	
TOTAL KVA		21,446		\$623.59	
Capacity Charge		\$136.00			
Energy Charge		\$623.59			
Total Capacity			•		
and Energy		\$759.59			
Subtotal	••	\$0.00			
City Revenue Cha	rge	\$0.00			
Subtotal		\$0.00			
KRST Exempt 100		\$0.00			
LRST Exempt 100	.00%	\$0.00			
Subtotal	••	\$0.00			
Other Charges		\$0.00			
TOTAL AMOUNT DUE		\$759.59			

Date: February

TOTAL ENERGY - KW	Н	19,370				
BILLING CAPACITY	- KVA	32				
					• • • • • • • • • • • • • • • • • • • •	
CAPACITY CHARGE		72	MA of Dillin	- Cit	. O. #/ /E =	#1/2 /0
(200) First (400) Next			KVA of Billin			\$142.40 \$0.00
Additional			KVA of Billin			
, ad to total				g capacit,		
TOTAL KVA		32				\$142.40
o	v				• 20 (K) (4 -	444 40
Ownership (Y/N)?	Ť	Less Substatio	on ownersnip b	iscount a	\$.2U/KVA =	(\$6.40
ENERGY GHARCE						\$136.00
ENERGY CHARGE	72 -	1 400	W.W. 0. 0. 07704	_		
		1,600 3,200				
		8,000				
EXCESS						
EXCESS	-	0,570			3 173.10	
TOTAL KVA		19,370			\$568.24	
	••••					
Capacity Charge		\$136.00				
Energy Charge		\$568.24				
Total Capacity			•			
and Energy		\$704.24				
Subtotal		\$0.00				
City Revenue Char	ge	\$0.00				
Subtotal		\$0.00				
KRST Exempt 100.	00%	\$0.00				
LRST Exempt 100.	00%	\$0.00				
Subtotal		\$0.00				
Other Charges		\$0.00				
TOTAL AMOUNT DUE		\$704.24				

Date: March

TOTAL ENERGY -	KWH	21,206			
		32			
CAPACITY CHARG					
(200) First		32	KVA of Billing (apacity @ \$4.45 =	\$142.40
(400) Next		0	KVA of Billing C	apacity @ \$4.25 =	\$0.00
Additional				apacity a \$4. 05 =	
				•	
TOTAL KVA		32			\$142.40
Ownership (Y/N	I)? Y			ount @ \$.20/KVA =	(\$6.40
					\$136.00
ENERGY CHARGE		4 (00	MIN 2 0 07724 -		
50 x	32 =	7,000	KWH @ 0.03720 =	\$59.62 \$102.59	
100 x		3,200	KWH @ 0.03206 =	\$230.88	
250 x		9,000	KWH @ 0.02886 = KWH @ 0.02666 =	\$224.10	
EXCESS	I	0,400		3224. 10	
TOTAL KVA		21,206		\$617.19	
Capacity Charg	je	\$136.00			
Energy Charge		\$617.19			
Total Capacity	′				
and Energy		\$753.19			
Subtotal		\$0.00			
City Revenue C	Charge	\$0.00			
Subtotal		\$0.00			
KRST Exempt 1	00.00%	\$0.00			
LRST Exempt 1		\$0.00			
Subtotal		\$0.00			
Other Charges	• • • •	\$0.00			
TOTAL AMOUNT D	UE	\$753.19			
			-		

Date: April

TOTAL ENERGY -	KWH	20,243			
BILLING CAPACIT					
					••••••••
CAPACITY CHARGE		73	MA of Dillion		- 44/2 /0
(200) First (400) Next				Capacity a \$4.45 :	\$142.40
Additional				Capacity a \$4.25	
Additionat				capacity a 34.05	- \$0.00
TOTAL KVA		32			\$142.40
Ownership (Y/N)	? Y			count a \$.20/KVA	= (\$6.40
ENERGY CHARGE					\$136.00
	32 =	1.600	KWH @ 0.03726 =	\$59.62	
100 x	32 =	3,200	KWH @ 0.03206 =	\$102.59	
250 x	32 =		KWH @ 0.02886 =	\$230.88	
EXCESS	=		KWH @ 0.02666 =		
			-		
TOTAL KVA		20,243		\$591.52	
			-		•
Capacity Charge		\$136.00			
Energy Charge		\$591.52			
Total Capacity					
and Energy		\$727.52			
Subtotal		\$0.00			
City Revenue Ch		\$0.00			
Subtotal	•••	\$0.00			
KRST Exempt 10	0.00%	\$0.00			
LRST Exempt 10	0.00%	\$0.00			
Subtotal		\$0.00			
Other Charges .	• • •	\$0.00			
			•		
TOTAL AMOUNT DU	E	\$727.52			

Date: May

TOTAL ENERGY - KI	MH.	25,151			
BILLING CAPACITY	- KVA	67			
CAPACITY CHARGE					
(200) First					\$298.15
(400) Next					\$0.00
Additional		0		apacity @ \$4.05 =	\$0.00
TOTAL KVA		67			\$298.15
Ownership (Y/N)?	Y	Less Substation		ount @ \$.20/KVA =	(\$13.40
					\$284.75
ENERGY CHARGE					
50 x	67 =	3,350	KWH @ 0.03726 =	\$124.82	
100 x	67 =	6,700	KWH @ 0.03206 =	\$214.80	
250 x	=	15,101	KWH a 0.02886 =	\$435.81	
EXCESS	=		KWH @ 0.02666 =		
TOTAL KVA		25,151		\$775.44	
	-				
Capacity Charge		\$284.75			
Energy Charge		\$775.44			
Total Capacity and Energy		\$1,060.19			
and Energy		41,000117			
Subtotal		\$0.00			
City Revenue Cha	rge	\$0.00			
Subtotal		\$0.00			
KRST Exempt 100	.00%	\$0.00			
LRST Exempt 100		\$0.00			
Subtotal		\$0.00			
Other Charges	• •	\$0.00			
			•		
TOTAL AMOUNT DUE		\$1,060.19			

Date: June

TOTAL ENERGY - K	CWH	32,977			
BILLING CAPACITY					
			• • • • • • • • • • • • • • • • • • • •		
CAPACITY CHARGE					
(200) First				•	\$378.25
(400) Next			-	apacity @ \$4.25 =	
Additional		0		apacity @ \$4.05 =	\$0.00
TOTAL KVA		85			\$378.25
Ownership (Y/N)?	Y			ount @ \$.20/KVA =	(\$17.00)
					\$361.25
ENERGY CHARGE	OE -	/ 250	KIN 0 0 07704 -		
50 x 100 x	85 =	4,250	KWH @ 0.03726 = KWH @ 0.03206 =	\$158.36	
		8,500	KWH @ 0.03206 =	\$272.51	
250 x	=		KWH @ 0.02866 =		
EXCESS	=	U		\$0.00	
TOTAL KVA		32,977		\$1,014.62	
			-		
		\$ 361.25			
Capacity Charge					
Energy Charge Total Capacity		\$1,014.62			
and Energy		\$1,375.87			
Subtotal		\$0.00			
City Revenue Cha	rge	\$0.00			
Subtotal		\$0.00			
KRST Exempt 100	.00%	\$0.00			
LRST Exempt 100	.00%	\$0.00			
Subtotal		\$0.00			
Other Charges	••	\$0.00			
TOTAL AMOUNT DUE		\$1,375.87			

Date: July

TOTAL ENERGY - KW	√H	41,782			
BILLING CAPACITY					
CAPACITY CHARGE					A/22 TF
(200) First				apacity @ \$4.45 =	
(400) Next				apacity @ \$4.25 =	
Additional		0	_	apacity @ \$4.05 =	\$0.00
TOTAL KVA		95			\$422.75
Ownership (Y/N)?	Y	Less Substation		ount @ \$.20/KVA =	(\$19.00
					\$403. <i>7</i> 5
ENERGY CHARGE	05	, == 4	иш о о отто/		
			KWH @ 0.03726 =		
			KWH @ 0.03206 =		
			KWH @ 0.02886 =		
EXCESS	=	3,782	KWH @ 0.02666 =	\$100.03	
TOTAL KI/A		41,782		\$1,267.81	
TOTAL KVA		41,702			
Capacity Charge		\$403.75			
Energy Charge		\$1,267.81			
Total Capacity					
and Energy		\$1,671.56			
Subtotal		\$0.00			
City Revenue Char	·ge	\$0.00			
Subtotal		\$0.00			
KRST Exempt 100.		\$0.00			
LRST Exempt 100.	.00%	\$0.00			
Subtotal		\$0.00			
Other Charges	•	\$0.00			
TOTAL AMOUNT DUE		\$1,671.56			
			-		

Date: August

TOTAL ENERGY - KW	Н	38,848			
BILLING CAPACITY	- KVA	93			
CAPACITY CHARGE					
(200) First		93	KVA of Billing	Capacity a \$4.45	\$413.85
(400) Next				Capacity @ \$4.25	
Additional		0	KVA of Billing	Capacity a \$4.05	\$0.00
TOTAL KVA		93			\$413.85
Ownership (Y/N)?	Y	Less Substati		scount a \$.20/KVA	= (\$18.60)
ENERGY CHARGE					\$395.25
	93 =	4.650	KWH a 0.03726	= \$173.26	
				= \$298.16	
		•		= \$671.00	
EXCESS				= \$43.94	
			-		•
TOTAL KVA		38,848		\$1,186.35	
			•••••	•••••	
Capacity Charge		\$395.25			
Energy Charge		\$1,186.35			
Total Capacity			-		
and Energy		\$1,581.60			
Subtotal		\$0.00			
City Revenue Char	ge	\$0.00			
Subtotal		\$0.00			
KRST Exempt 100.	00%	\$0.00			
LRST Exempt 100.	00%	\$0.00			
Subtotal		\$0.00			
Other Charges	•	\$0.00			
TOTAL AMOUNT DUE		\$1,581.60			

Date: September

TOTAL ENERGY - KW	Н	27,673			
BILLING CAPACITY					
CAPACITY CHARGE (200) First		76	YVA of Billing C	apacity @ \$4.45 =	\$338 2N
(400) Next				apacity @ \$4.25 =	
Additional				apacity @ \$4.05 =	
Additionat					
TOTAL KVA		76			\$338.20
Ownership (Y/N)?	Y			ount @ \$.20/KVA =	(\$15.20)
					\$323.00
ENERGY CHARGE		_			
50 x	76 =	3,800	KWH a 0.03726 =	\$141.59	
100 x	76 =	7,600	KWH @ 0.03206 =		
	×		KWH @ 0.02886 =		
EXCESS	=	0	KWH @ 0.02666 =	\$0.00	
TOTAL KVA		27,673		\$854.88	
Capacity Charge		\$323.00			
Energy Charge		\$854.88			
Total Capacity					
and Energy		\$1,177.88			
Subtotal		\$0.00			
City Revenue Char	ge	\$0.00			
Subtotal		\$0.00			
KRST Exempt 100.	00%	\$0.00			
LRST Exempt 100.	00%	\$0.00			
Subtotal		\$0.00			
Other Charges	•	\$0.00			
TOTAL AMOUNT DUE		\$1,177.88			

Date: October

TOTAL ENERGY - KW	Н	20,894			
BILLING CAPACITY	- KVA	32			
CAPACITY CHARGE					
(200) First				Capacity a \$4.45	
(400) Next				Capacity a \$4. 25	
Additional		0		Capacity a \$4.05	\$0.00
TOTAL KVA		32			\$142.40
Ownership (Y/N)?	Y			scount @ \$.20/KVA	= (\$6.40
CHEROV CHARGE					\$136.00
ENERGY CHARGE 50 x	to -	1 400	MUR 2 0 03724	= \$59.6	· · · · · · · · · · · · · · · · · · ·
100 x				= \$59.6 = \$102.5	
	32 =		KWH @ 0.03208		
	=		KWH @ 0.02666		
EAGE OF					••
TOTAL KVA		20,894		\$608.8	7
			-		
Capacity Charge		\$136.00			
Energy Charge		\$608.87			
Total Capacity					
and Energy		\$744.87			
Subtotal		\$0.00			
City Revenue Charg	ge	\$0.00			
Subtotal		\$0.00			
KRST Exempt 100.0	00%	\$0.00			
LRST Exempt 100.0	00%	\$0.00			
Subtotal		\$0.00			
Other Charges	•	\$0.00			
TOTAL AMOUNT DUE		\$744.87			

Date: November

TOTAL ENERGY - KW	Н	20,591			
BILLING CAPACITY					
					• • • • • • • • • • • • • • • • • • • •
CAPACITY CHARGE		32 YVA of	Rilling Capaci	ity @ \$4.45 =	\$142.40
(200) First (400) Next				ity @ \$4.25 =	\$0.00
Additional			•	ity a \$4.05 =	\$0.00
TOTAL KVA		32			\$142.40
Ownership (Y/N)?	Y	Less Substation Owners	ship Discount	a \$.20/KVA =	(\$6.40)
					\$136.00
ENERGY CHARGE					
		1,600 KWH @ 0			
		3,200 KWH @ 0			
250 x	32 =	8,000 KWH @ 0			
EXCESS	=	7,791 KWH @ 0		\$207.71	
TOTAL KVA		20,591		\$600.80	
Capacity Charge		\$136.00			
Energy Charge		\$600.80			
Total Capacity					
and Energy		\$736.80			
Subtotal		\$0.00			
City Revenue Charg	ge	\$0.00			
Subtotal		\$0.00			
KRST Exempt 100.0	00%	\$0.00			
LRST Exempt 100.0		\$0.00			
Subtotal		\$0.00			
Other Charges	-	\$0.00			
TOTAL AMOUNT DUE		\$736.80			

Date: December

TOTAL ENERGY - K	WH	21,398			
BILLING CAPACITY	- KVA	32			
CAPACITY CHARGE					
(200) First				Capacity @ \$4.45 =	
(400) Next				Capacity @ \$4.25 =	
Additional		0		Capacity a \$4. 05 =	\$0.00
TOTAL KVA		32			\$142.40
TOTAL KVA					\$142.40
Ownership (Y/N)?	Y	Less Substati	on Ownership Dise	count a \$.20/KVA =	(\$6.40)
ENERGY GUARGE					\$136.00
ENERGY CHARGE 50 x	32 -	1 400	MUN 2 0 03724 -		
100 x	32 -	7,000	KWH & 0.03726 -	\$59.62 \$102.59	
100 x 250 x	32 =	3,200 8 000	KWH @ 0.03206 = KWH @ 0.02886 =	\$230.88	
	J2 - =		KWH @ 0.02666 =		
EXCESS		0,370		J LL7.LL	
TOTAL KVA		21,398		\$622.31	
TOTAL KYA					
Capacity Charge		\$136.00			
Energy Charge		\$622.31			
Total Capacity					
and Energy		\$758.31			
Subtotal	••	\$0.00			
City Revenue Cha	rge	\$0.00			
Subtotal	••	\$0.00			
KRST Exempt 100	.00%	\$0.00			
LRST Exempt 100	.00%	\$0.00			
Subtotal	••	\$0.00			
Other Charges	••	\$0.00			
			•		
TOTAL AMOUNT DUE		\$758.31			
			•		

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent asency is USACE.	TE ANAL	YSIS	cy is USA		INVITATI	INVITATION/CONTRACTOR	стоя	EFFECTIVE PRICING DATE Taniary 1992	FICING DA	ATE	DATEPREPARED Anril 10	1997	
100.000					100			nnino	7		TTTTU		
Irwin Army Community Hospital		- EEAP			CODE (Check one)	eck one)	٥	DRAWING NO	o.		SHEET	6	SHEETS
LOCATION Fort Rilay Kansas					<u>[</u>]	ESTIMATOR			CHECKED BY	F	
	QUA	QUANTITY			LABOR		EOL	EQUIPMENT	M	MATERIAL	-	IHS SHI	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	MH CNIT	TOTAL	PRICE	C08T	PRICE	C08T	PAICE	COST	TOTAL	TIND	TOTAL
SHEET C						٠					29,224		
SHEET 3											59774		
SUBTOTAL											28.448		
CONTRACTOR OH @	1590	h									13,350		
SUBTOTAL										1	162,348		
CONTRACTOR PROFIT @		1090									10235		
SUBTOTAL										l	112,583		
CONTINGENCIES	3	5.590	Ь			:					2619		
CONSTRUCTION C	GOST										118,775		
SIOH @ 6.0 90											7127		
TOTAL THIS SHEET											125,900		
DA FORM SA18-R, Apr 86													

COST ESTIMATE ANALYSIS	E ANAL	SIS		,	INVITAT	INVITATION/CONTRACTOR	стоя	EFFECTIVE PRICING DATE	RICING DA	ATE	DATE PREPARED	red 000	
For use of this form, see TM 5-800-2; the proponent agency is USACE.	the propo	nent agen	CY IS USA	ن				Jailus	2	7	Aprir	726	
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)	heck one)	٥	DRAWING NO.	ć		SHEET 0	or 3	SHEETS
Z] []]	ESTIMATOR			CHECKED BY		
Fort Riley, Kansas						ОТНЕЯ					R. D.	Frymire	e
	QUAN	DUANTITY			LABOR		EQ	EQUIPMENT	Ì	MATERIAL		ŝ	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH UNIT	TOTAL HRS	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL WT
N.~													
INSULATING GLASS		PEPLACE		KIND	DOM I	- STINK	מותם	Buldping	(019		-		
REMOVE EXISTING													
SINGLE PANE & D.H.													
ALUM. KINDOM UNITS													
4 INTERIOR STORM													
MINDOMS	339	EA		1	5	5085					5085		
INSTALL NEW DOUBLE													
HUNG BRONZE TINTED													
ALUM MINDOW UNITS													
W/THERMAL BREAK,													
1-INCH INSULATING													
GLASS & SCREENS	101	EA			39	3939	١		200	20,200	20,200 24139		
TOTAL THIS SHEET											29,224		
DA FORM 5418-R, Apr 86													

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	FE ANAL	YSIS	cy is USAC		INVITAT	INVITATION/CONTRACTOR		EFFECTIVE PRICING DATE January 1992	RICING D 1992	ATE	DATE PREPARED April 1992	1ED 992	
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)	eck one)	ر	DRAWING NO			SHEET S	9 6	SHEETS
LOCATION Fort Riley, Kansas] [ОТНЕЯ	,	ESTIMATOR			CHECKED BY	Frvmfre	
	QUA	QUANTITY			LABOR		EQL	EQUIPMENT	Ň	MATERIAL		8	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	MH UNIT	TOTAL HRS	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TIMO	TOTAL
INSTALL 2-INCH													
THICK PROCELEAN						٠							
FINISHED INSULATING													
PANELS (3'-0"X 5'-0")													
	3570	30	I	1	3.01	16,746	ı		242	44268	55014		
CAULK NEW KINDOWS													
	4000	7	1		10.1	4040			0.18	720	4760		
		-											
TOTAL THIS SHEET											59,774		
DA FORM 5418-R, Apr 85													

THE EXISTING HOSPITAL ENTRY VESTIBULE DOES NOT HAVE EHOUGH SPACE BETWEEN SETS OF DOORS.
THIS CONDITION ALLOWS BOTH SETS OF DOORS TO BE OPEN AT THE SAME TIME. THIS ALLOWS A LARGE AMOUNT OF UNCONDITIONED OUTSIDE AIR INTO THE HOSPITAL LOBBY WHENEVER THE ENTRY IS USED. THE NEW ENTRY VESTIBULE LAYOUT IS LENGTHENED SO THAT BOTH SETS OF DOORS ARE NOT OPEN AT THE SAME TIME. GAS ENERGY WILL BE SAVED BY NOT HEATING THE EXCESS INFILTRATION AIR. ELECTRICAL ENERGY IS SAVED BY NOT COOLING THE EXCESS INFILTRATION AIR. HEATING AND COOLING BINS WERE CALCULATED TO DETERMINE THE AVERAGE OUTSIDE AIR TEMPERATURE DURING THE SUMMER AND WINTER MONTHS,

GAS EHERGY SAVING

INFILTRATION CFM - 7'x6' DOOR OPENING x 0.25 1/50PT = 10.5 CFM

FOR EVERY TIME A PERSON ENTERS OR EXITS.

TRAFFIC RATE - 500 TIMES OPEN A DAY

INSIDE DESIGN TEMP = 68°F

HEATING BIN TEMP = 34°F

BIN HOURS = 3941

105 CFM x 500 x 1.08 x (68-34°F) x 3941 Hrs +0.8 +0.78 x1.1 + 1.031 x 106 = 1299 MCF ELECTRICAL ENERGY SAVING

INFILTRATION CFM-10.5 CFM PER TIME OPENED

TRAFFIC RATE - 500 TIMES OPENED PER DAY

INSIDE DESIGN TEMP = 78°FdB G5°FWD h=30

COOLING BIN TEMP = 83°FdB G9°FWD h=33.25

BIN HOURS = 1646

CHILLER KW/TON APPROX |

10.5 CFM × 500 × 4.5 × (33,25-30) +12000 BTUH/TON = 6.4 TOLL 6.4 TOLL × 1 KW/TON × 1646 HRS = 10,534 KWH

ANNUAL ENERGY SAVING

10,534 KMH x 3413 BTYKWH = 36 x 10°

1299 MCF x 1.031 x 10° BTYMCF 1339 x 10°

1375 x 10° BTV/YR

ANHUAL DOLLAR SAVING 10,534 KHH × 0,038 1/KHH = 400 1299 MCF×3,7 1/MOF = 4806 5,206 \$/YR HEATING BIN FOR FORT PILEY, KS OCTOBER TO APRIL, 24 HR/DAY REFER: TM 5-785

BIN	AVG TEMP OF	Hours 0-24	of Hours
50/54	52	424	22048
45/49	48	473	22704
40/44	42	528	22176
35/39	37	600	22200
30/34	32	595	19040
25/29	27	466	12582
20/24	22	327	7194
15/19	17	223	3791
10/14	12	141	1692
5/9	7	96	672
0/4	2	43	86
-5/-1	- ろ	21	-63
-101-6	-8	4	- 32
		3,941	134,090

AVERAGE WINTER OUTSIDE AIR TEMPERATURE

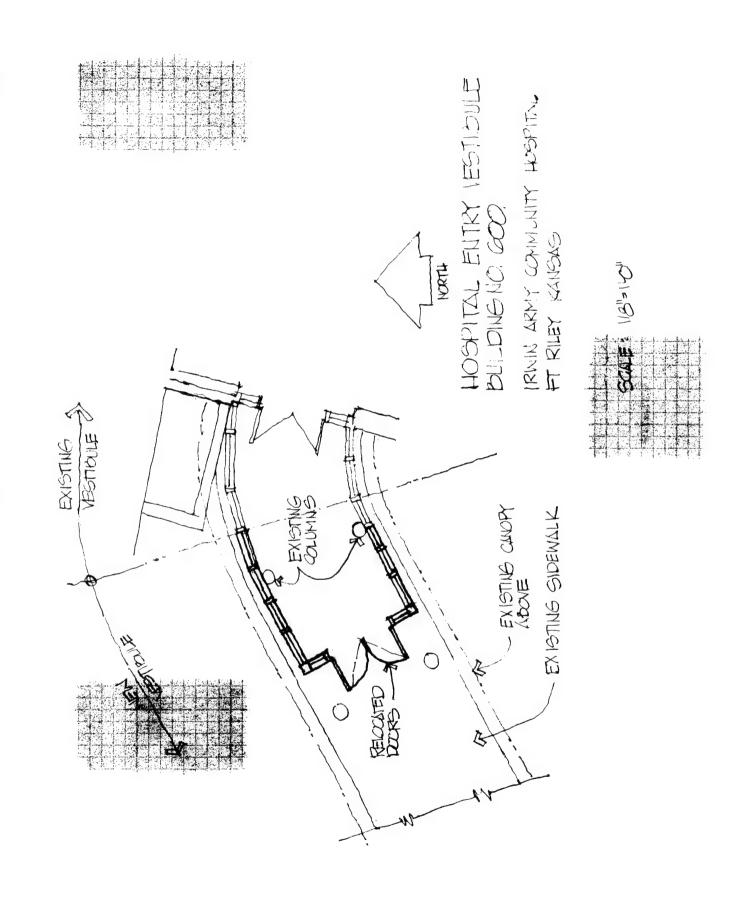
134,090 · F HOURS = 34 · F 3,941 Hours LOOUILS BIN
FOR PT. RILEY, KS MAY TO SEPTEMBEL, 24 HR/DAY
REFER TH 5-785

B17	AVG TEMP OF	Hours 0-24	of Hours
75/79	77	587	45199
80/84	82	479	39278
35/89	87	314	27318
90/94	92	181	16652
95/99	97	65	6305
100/104	102	20	2040
		1646	136,792

AVERAGE OUTSIDE AIR TEMPERATURE

136792 = 83°F dB MCWB=69°F

1646



FOOLEGATION FOR RILEY, Kansas COLANTITY TASK DESCRIPTION WO. OF UNIT WH TO UNIT WEAS CONTITY CON	AP		1000				-				
COESCRIPTION NO. OF UNITS VEEKLIES 5.5 ELICTION LOST H 6%	١п		×		۴	DRAWING NO.	ď		SHEET /	70	SHEETS
COESCRIPTION NO. OF NO. OF NO. OF NO. OF NO. OF SACRES S.S. S.S. S.S. S.S. S.S. S.S. S.S. S	П		01 F			ESTIMATOR	两		CHECKED BY R. D.	Frymire	e e
COESCRIPTION NO. 07 V. S.		2	LABOR		EQU	EQUIPMENT	Σ	MATERIAL		*	SHIPPING
VGENCUES VGENCUES ELUCTION LOST H	MH UNIT	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL
	16/4 1	/							8434		
	0			•					464		
									8898.		
									534,		
•											
-											
. •											
TOTAL THIS SHEET									9432		

COST ESTIMATE ANALYSIS	E ANALYSIS			INVITATION	ě		EFFECTIVE PRICING DATE	ECTIVE PRICING D	ATE	DATE PREPARED	RED	
For use of this form, see TM 8-800-2; the proponent agency is USACE.	the proponent a	gency to US/	IČE.	200	0010		Samar	y 1776		APLIL 1	726	
PROJECT Louis Army Community Hospi	Hospital - EEAP	۵		CODE CHECK	rck one)	ںے	ON DNIWARD	.1		SHEET 2	8	SHEETS
N N N N N N N	BUILINING	(A)7 0)		<u></u> [1	ESTIMATOR	码		CHECKED BY R. D.	Frymire	a)
TOLL MILEY, MAILSON	QUANTITY			LABOR		EQU	EQUIPMENT	Σ	MATERIAL		š	SHIPPING
TASK DESCRIPTION	NO. OF UNIT	EN CNI	TOTAL	PRICE	C08T	PAICE	COST	PRICE	1900	TOTAL	WIT	TOTAL
HOSPITH EVITEY	UEST16.	SUE	-8	110011	239 =	,						
					•							
O: RECORTE, RESET												
ONL PAIR OF EXISTING												
32×1º N. BITRY DKS												
NXC SIDE & TRAISCAN												
ZIMIZ MANTS	57 1	22								780		
· EXTENO EXISTING												
11 STORE FRONT												
SIDEUDUL SYSTEM												
24.0"x100"4	to ohe		·	3,18	199			12.	2820	3547.		
· PREP EXISTING												
CANCAS SOFFIT AND												
EXPOSED EMUS OF												
EXISTING DLUM												
TOTAL THIS SHEET		-										
DA FORM 8418-R, Apr 86												

For use of this form, see TM 8-800-2; the proponent agency is UBACE. PROJECT Invin Army Community Hospital - EEAP LOCATION FOR Riley, Kansas QUANTITY TASK DESCRIPTION NO. OF UNIT UNITS MEAS UNIT TO UN	proponent eger	cy is USAC		7	5	`			1	TTTAV	1777	
Tey, Kansas Ley, Kansas Lek DESCRIFTION NO WATHER CALIFIES LINE LI							Jailuary	ary 1992				
ley, Kansas SK DESCRIFTION UN WITH MITTER [CODE (Check one)		۳	DRAWING NO.	1		SHEET 3	40	SHEETS
SCRIPTION NO.	1	BUILDING PCD	B	<u>.</u>	OTHER		ESTIMATOR	两		CHECKED BY R. D.	Frymire	v
NO N	DUANTITY			LABOR		100	EQUIPMENT	¥	MATERIAL		*	BHIFFING
Sett MES	OF UNIT	ENO.	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL WT
	12 Malle	i	C34721	well	7							
					•							
STOUS-CONT-EACH TO												
RECEILE NEW CONSTR.	1 3									680.		
MINOR BLACTOROS												
REUS MIS	87 /									400.		
								M	SUBTOTAL	5397		
SLIBOUTTACTORS PH 15	15%									010		
7	20									540		
										6747		
PRINC COURSOCIES ON 15	251									6101		
Drawie Constructors profit	200									675		
					COM	PINSTRUCTION	\sim	105T 7	CIEN.	8,434		
TOTAL THIS SHEET												

THE EXISTING EMERGENCY VESTIBULE DOORS ARE SPACED 19'-4" APART. THIS DISTANCE IS MORE THAN ADEQUATE FOR A VESTIBULE BUT DUE TO THE EMERGENCY NATURE OF THE TRAFFIC BOTH SETS OF DOORS WILL BE OPEN AT THE SAME TIME. CURRENTLY THE DOORS ARE BOTH OPEN FOF AN OVERLAPPING PERIOD OF 10 GECONDS. THIS TIME OVERLAP CAN BE REDUCED TO 5 SECONDS BY ADJUSTING THE DOOR HOLD OPEN DEVICES AND EXTENDING THE VESTIBULE BY 5'-0"

GAS ENERGY WILL BE SAVED BY NOT HAVING TO HEAT THE EXCESS INFILTRATION AIR, ELECTRICAL ENERGY IS SAVED BY NOT COOLING EXCESS INFILTRATION AIR, HEATING AND COOLING BINS WERE CALCULATED TO DETERMINE THE AVERAGE OUTSIDE AIR TEMPERATURE DURING THE SUMMER AND WINTER MONTHS.

GAS ENERGY SAVING INFILTRATION CFM 7' x 6 DOOR OPENING x 1 CFM/49FT = 42 CFM so for 10 SECONDS '7 CFM' 5 SECONDS 3.5 CFM SAVED EVERY TIME A PERSON ENTERS OR EXITS, = 100 TIMES OPEN A DAY

TRAFFIC RATE

INSIDE DESIGN TEMP = 68'F = 34.F HEATING BIN TEMP = 3941 BIN HOURS

= 1.08 FOR SENSIBLE HEAT AIR CONSTANT

= PIPING 90% HEAT X-CH 80% BOILER 78% EFFICIENCIES

3,5 CFM x 100 x 1.08 x (68-34F) x 3941 HRS + 0.9+0.8+0.78+1.031x10 = 87 MCF

ELECTRICAL ENERGY GAVING INFILTRATION CFM GAVED = 3.5 TRAFFIC RATE = 100 PER DAY INSIDE DESIGN = 78. FdB US. FWb h=30 COOLING BIN TEMP - 83. FdB 69. Fub h= 33.25 BIN HOURS = 1646 CHILLER KW/TON = 1

3.5 CFM x 100 x 4.5 x (33.25-30) + 12000 BTUH/TON = .43 TONS .43 TONS x 1KW/TON x 1646 HRS = 708 KNH

ANNUAL ENERGY SAVING 87 MCF x 1,031 x 10° BTU/MCF 708 KWH x 3413 BTU/KWH

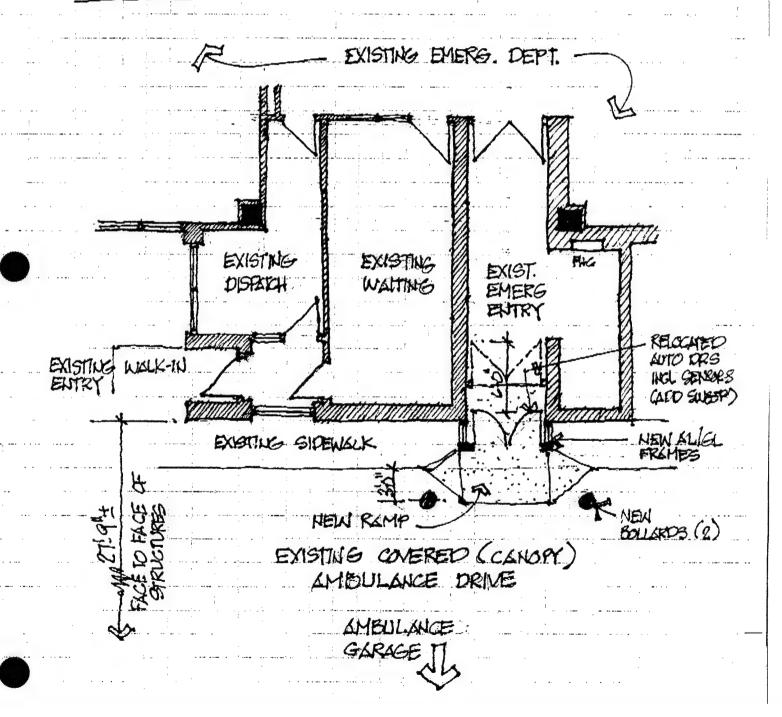
= 897 × 106 = 2.4 × 106 92.1 × 106 BW/4R

ANHUAL DOLLAR SAVING 87 MCF x 3,7 \$/MCF 708 KWH x .030 \$/KWH

= 322 = <u>27</u> 349 \$/4R

COST ESTIMATE ANALYSIS	E ANALYSE	5			NVITATION	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	RED	
use of this for	the proponent	t agency	• USACE						Janua	January 1992	April 1992	1992	
PROJECT Irwin Army Community Hospital	1	EEAP			CODE (Check one)	ck one)	٥	DRAWING NO	١.		SHEET	o.	SHEETS
LOCATION Fort Riley, Kansas						ОТНЕЯ		ESTIMATOR			СНЕСКЕВ ВУ	Fromtre	
	QUANTITY			۳,	LABOR		Eal	EQUIPMENT	Ì	MATERIAL		28	SHIPPING
TASK DESCRIPTION	NO. OF UNITE ME	UNIT MH	TINI	TOTAL	PRICE	COST	UNIT	COST	PRICE	C08T	TOTAL	TIND	TOTAL
STEEL BOLLALDS-2	2 EA	4				•			250	500	500		
RELOC. ENTRY DOONS	I EA	4									000		
ADD FINTRY	1 EA	4									250		
NEW SIDE CITE	I EA	1									700		
RELOCIANT AUTO SENEOUS 2	52 EA	<1			SLI	350					350		
SUBTOTAL											7.800		
CONTRACTOR	0H @ 15%	-90									420		
	ROFIT (C	10,0									280		
SUBTOTAL											3500		
%9 HOIS											210		
TOTAL											2710		
TOTAL THIS SHEET													
DA FORM 6416-R. Apr 86													

AMBULANCE ENTRY REVISIONS C GENERAL COMMENT --- ITEM -- NO. 27) IACH-EESP



HEATING BIN FOR FORT PILEY, KS OCTOBER TO APRIL, 24 HR/DAY REFER: TM 5-785

		r	
BIN	ANG	Hours	of Hours
	TEMPOF	0-24	
50/54	52	424	22048
45/49	48	473	22704
40/44	42	528	22176
35/39	37	600	22200
30/34	32	595	19040
25/29	27	466	12582
20/24	22	327	7194
15/19	17	223	3791
10/14	12	141	1692
5/9	7	96	672
0/4	2	43	86
-5/-	-3	21	-63
-10/-6	-8	4	- 32
		3,941	134,090
1			

AVERAGE WINTER OUTSIDE AIR TEMPERATURE

134,090 · FHOURS = 34 · F 3,941 Hours COOLING BIN FOR FT. RILEY, KS MAY TO SEPTEMBER, 24 HR/DAY REFER TH 5-785

BIH	AVG TEMP F	Hours 0-24	of Hours
75/79	77	587	45199
80/64	82	479	39278
85/89	87	314	27318
90/94	92	181	16652
95/99	97	65	6305
100/104	102	20	2040
		1646	136,792

AVERAGE OUTSIDE AIR TEMPERATURE

136,792 = 83 F dB MCWB = 69 F

1646



SERIES:7000 ADVANTAGES

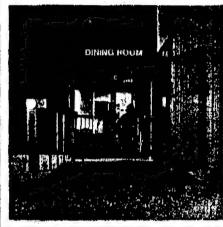
- Low Energy Automatic Swing Operator
- Manual/Automatic
- Barrier Free Entry
- Complies with ANSI AT IZ and
- Requires No Structural Changes
- Easy Installation

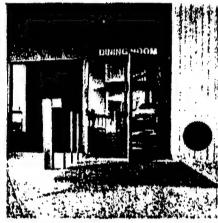
OPERATOR **FEATURES**

- Slow Opening Slow Cleaning Speed Adjustable
- Adjustable Time Delay
- Time Out : Safety Feature Cuts Off Operator Opening Force When Stalled
- Push Button Actuation
- "PUSH-N-GO!" Optional Rower









"Easy Access" is a manual/automatic swing door operator especially for partier-free openings for the handicapped. May be in stalled on an existing swing door it is a low powered slow opening operator that includes adjustable time delay to hold door in open position (variable 3/2) seconds); a OTE: Handicap codes require a 1 record acting. It meets the requirement of ANSI standar A156.19 when adjusted in accordance with the standard.

Two methods of activating the automatic door are available. The control box is furnished with a switch that enables the owner to

select the desired operation

1. Manual operation when pushed toper resutematic regardien, when activated by push-button switch.

The most common scriptific is a post charger switch that define resided on the door or adjacent door jamb. Proper place ment of the switch allows the general public to use his operation as a planual door. Affectively conserving energy—as well as a automatic door when push-button scripting. The door uniomatically opens and then recloses after time-delay expiration.

2. "Push and Go! - Automatic operation by since pushing incure open manually or by push-button switch. The time delay before closing when manually pushed is 30% less than when push-button is actuated.

Honon's t'Push and Go! Issuite makes the door tasy to operate for everyone. Simply pushing on the door turns on the operator it will open at the set speed and then close.
"Time Out! is another issuite. When all postputual terms out in a description will trip out of the automatic mod

and enter the manual mode

This slow-speed operator concern can lower in a latter tost - 2 much 25 50% by climinating need for guard rails and floo switch mats.



INSTALL AN OCCUPANCY GENSOR LIGHT SWITCH IN THE 1975 ADDITION OFFICES
THAT ARE OCCUPIED 12 HR/DAY
AND THAT CONTAIN AT LEAST I FOUR LAMP
FLUORESCENT FIXTURE, THE AVERAGE
OFFICE CONTAINS I FOUR LAMP FIXTURE.
FROM MANUFACTURER AND USER STUDIES
WHICH WE HAVE RESEARCHED 50% SAVINGS
ARE INDICATED. OUR LATEST ESTIMATE
INDICATES 300 ROOMS QUALIFY.

BOO ROOMS × 0.2 KM × 12 HR × 5 DAY , 52 MEEK × 0.5 = 93,600 KWH

ROOM DAY WEEK TR

ANNUAL ENERGY SAVING
93,600 KWH × 3413 BTU/KWH = 319.4 x 10° BTU/YR

ANNUAL DOLLAR SAVING 93,600 KUH x 0.038 \$/KUH = 3557 \$/4R

يدالت وينا والهاديات المالينية

COST ESTIMATE ANALYSIS	TE ANAL	SIS			INVITAT	INVITATION/CONTRACTOR	Г	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	4ED	
use of this for	; the propor	nent agent	Y IS USAC	ĬĒ.				January 1992	ry 199	2	April 1992	1992	
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)		٥	DRAWING NO	·		SHEET	o.	SHEETS
LOCATION] []]	ESTIMATOR			CHECKED BY		
FOIL KILEY, Kansas	QUANTITY	TITY			LABOR	ОТНЕЯ	E01	FOURMENT	2	MATERIAL	R. D.	Frymire	re
TASK DESCRIPTION	NO. OF	-	AH CNIT	TOTAL	PRICE	CO8T	PRICE	COST	PRICE	COST	TOTAL	TINO	TOTAL
OCCUPANCY SENSOR 300	308	EA			15	4500			85	25500	30,000		
						•							
CONTRACTOR OH	15%										4500		
11 PROFIT	10,0										3000		
508707AL											31900		
3 CONSTRUCTION DOST											37500		
#01S	6%										2250		
						:							
											·		
	·												
TOTAL THIS SHEET											39.750		
DA CORT EASE A SE													

DA FORM 5418-R, Apr 85

SUMMARY OF ENERGY SAVINGS FOR PROJECT

BLDG 600 WINDOWS 269.5 MCF BLDG 600 WINDOWS 418 MCF BLDG 600 MAN ENTRY 1299 MCF BLDG 600 EMERGENCY ENTRY 87 MCF 1973.5 MCF

BLDG 600 WINDOWS 35,695 KWH
BLDG 600 WINDOWS 139517 KWH
BLDG 600 MAIN ENTRY 10534 KWH
BLDG 600 EMERGENCY ENTRY 708 KWH
BLDG 600 OCCUPANCY SENSOR 93,600 KWH
280,054 KWH

TOTAL ANNUAL ENERGY SAVING
1973.5 MCF x 1.031×10° BTU/KWH = 2034.7 x 10°
280,054 KWH x 3413 BTU/KWH = 955.8 x 10°
2990.5 x 10° BTU/YR

TOTAL ANNUAL DOLLAR SAVINGS 1973.5 MCF × 3.7. 8/MCF = 7302 280,054 KWH × 0.038 \$/KWH = 10642 17,944 \$/KR

ANNUAL DEMAND SAVINGS 4846 \$ - 2848 \$ = 1998 \$ /4R TOTAL ANNUAL HON RECURRING MAINTENANCE FOR CAULKING \$4760

TOTAL ANNUAL RECURRING SAVINGS FOR DEMAND AND WINDOW WASHING

BLDG 600 NONE - GLASS AREA REMAINS SAME BLDG 610 WASHING 312 \$112

BLDG 610 MASHING 312 \$79R BLDG 610 DEMAND 1998 \$1/4R 2310 \$1/4R

COST ESTIMATE ANALYSIS For use of this form, see TM 8-800-2; the proponent semicy is UBACE.	TE ANAL	YSIS nent agen	ey Is USA		INVITAT	INVITATION/CONTRACTOR	CTOR	EFFECTIVE PRICING DATE MARCH 1992	PRICING D	ATE	MARCH 18, 1992	RED , 1992	
PROJECT COMMUNITY HOSPITAL	TAT -	EEAP			CODE (Check one)	heck one)	o	DRAWING NO.	o .		SHEET /	8	SHEETS
LOCATION FORT RILEY, KANSAS						ОТНЕЯ		ESTIMATOR	WAB		CHECKED BY R. D. FRY	FRYMIRE	
	QUA	QUANTITY		٦	LABOR		03	EQUIPMENT	M.	MATERIAL		•	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH UNIT	TOTAL	PRICE	C08T	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL
SHEET 20F3											56086		
SHEET 30F3						•					8898		
										•			
SUBTOTAL											145084		
SUBCONTRACTOR OF	15%										21763		
PLOFIT	7.01										14510		
71										,			
10TOT											181,357		
									,				
TOTAL THIS SHEET													
DA FORM 6418-R, Apr 86								•					

COST ESTIMATE ANALYSIS	TE ANAL	YSIS			INVITATI	INVITATION/CONTRACTOR		EFFECTIVE PRICING DATE	AICING D	ATE	DATE PREPARED	ED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.	2; the propo	Shent agen	cy le USA	ĠĒ.				MARCH 1992	92		MARCH 18,	1992	
PROJECT IRWIN ARMY COMMUNITY HOSPITAL	ITAL -	ĖEAP			CODE (Check one)	eck one)	٥	DRAWING NO.	Ġ		8HEET 2	9	SHEETS
LOCATION FORT RILEY, KANSAS						ОТНЕЯ		ESTIMATOR	WAB		CHECKED BY R. D. FRY	FRYMIRE	
	αnγ	QUANTITY			LABOR		EOU	EQUIPMENT	¥	MATERIAL		HS	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL
5UMMARY													
BUILDING GOO						-							
DEMOLITION	_	EA									83/		
2 File WINDOWS	N M	355			4.8	1707			25.2	8946	10,053		
BAKERY & DINE WINDOWS	8	EA			39	180			250	5000	5,780		
QAULKING	575	LF			101	530			8/-	95	625		
BELOCATE MAIN ENTRY	57	-									18		
NEW STOREFRONT	SF	340			2.78	667			لا)	2880	3547		
PREP SOPFIT	/	57									650		
ELECTUC REVISINS	-	C									480		
RELOCATE ENSK. DOOK	~	B									000/		
ADD ENTRY & BOLLARDS		EZ									750		
NEW SIDE LIGHT.		EA									700		
RELOCATE SEKOKS	7	EA			175	350					350		
OLLUPANCY SENSORS 300	30	EA			15	4500			85	25500	30000		
TOTAL THIS SHEET											56,086		
DA FORM 6418-R. Apr 86													

COST ESTIMATE ANALYSIS	TE ANAL	rsis	3 4 5 7	,	INVITAT	INVITATION/CONTRACTOR	стоя	EFFECTIVE PRICING DATE	RICING C)ATE	DATE PREPARED MADCH 18 1002	1007	
PROJECT IRWIN ARMY COMMUNITY HOSPITAL	TTAL -	ĖĒAP			CODE (Check one)		۲	DRAWING NO.			SHEET 3	or 39	SHEETS
LOCATION FORT RILEY, KANSAS					֓֟֞֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֟֟֓֓֓֟֟֓֓֓֟֓֓֟֟֓֓֟֓֓	1	,	ESTIMATOR	WAB		10	BY FRYMIRE	
	QUAN	QUANTITY			LABOR		EO	EQUIPMENT	2	MATERIAL		ŝ	BHIPPING
TASK DESCRIPTION	NO. OF UNITE	UNIT	MH UNIT	TOTAL	UNIT	COST	PRICE	COST	PRICE	1800	TOTAL	TW	TOTAL
SUMMAKT CONT													
BUILDING 610						•							
DEMOLITION	339	EA			15	5085					5085		
WIND MODILE	0	EA			39	3939			32	29200	24139		
2" INSUL PANELS	3570	1/2			3,01	10746			12,4	44268	55014		
CAULKIN G	400	CF.			101	4040			8).	720	4760		
73												ıl	
											8648		
-													
-													
TOTAL THIS SHEET													
DA FORM 6418-R. Apr 26													

DA FORM SAIS-R, Apr 86

ciect. ENERGY ENGINEERING ANALYSIS E	ROGRAM (EEAP)
iiiiiiii	
temporary:	program year
permanent:	
pint of contact:	
nser name <u>Maj</u> . James Fletcher	date28 August 1991
titleChief of Logistics	
	autovon
dfae name <u>Larry Stillwagon</u>	date20 August 1991
title Base Energy Officer	
	autovon
engineer district nameRobert Miller	date28 August 1991
title Project Manager	
	autovon
other (A-E) name Randall D. Frymire	date27 August 1991
title Project Manager	phone(816) 931-2200
	autovon
eviewed by: installation facility engineer name Larry Stillwagon	date28 August 1991
	(0.0) 000 0071
title Base Energy Officer	phone (913) 239-2371
	autovon
pproved by:	
macom engineer	
name	date
title	phone
	autovon

project development brochure, PDB-1

facility

IRWIN ARMY COMMUNITY HOSPITAL FT. RILEY, KANSAS

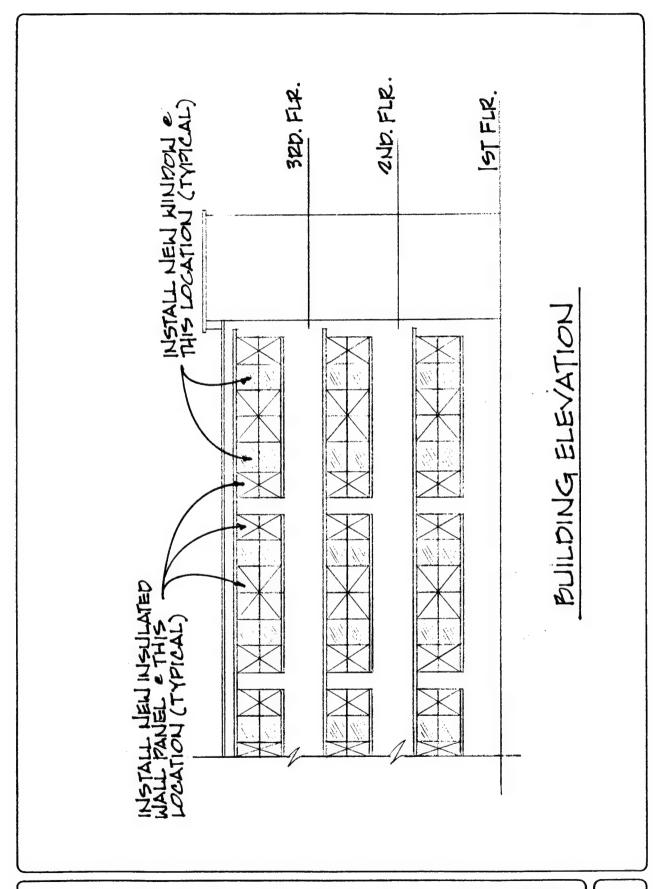
project coordinator for using service

LARRY STILLWAGON
BASE ENERGY OFFICER

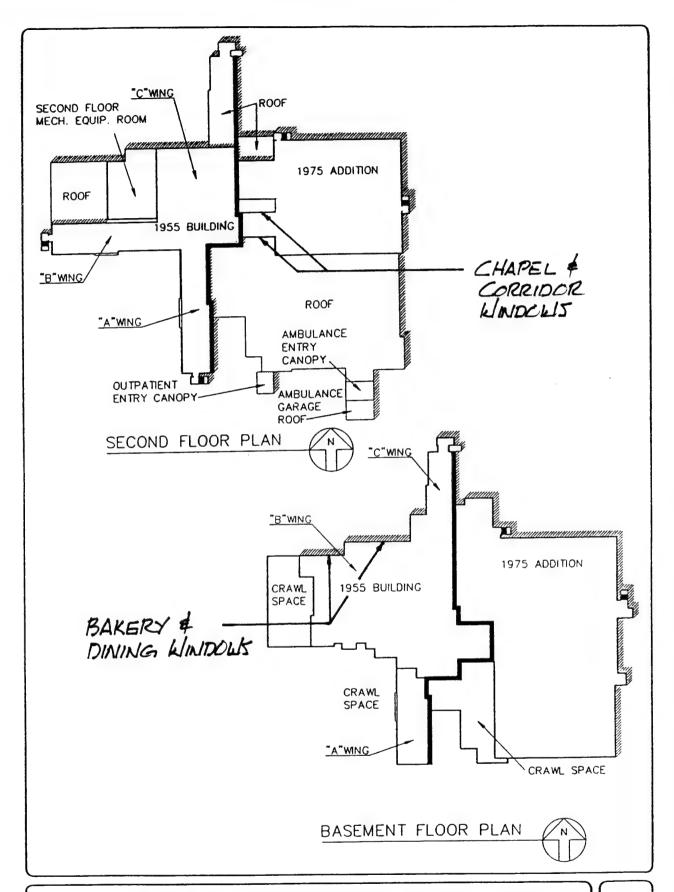
OBJECTIVE

The objective of this project is to update windows and door entries in Building 600 and 610 that have not been upgraded in previous projects. The work required would be to install new tinted 1" insulated glass windows with thermal break frames and 2" insulated wall panels in place of existing single pane glass windows with storms in Building 610 and to install new tinted 1" insulated glass windows with thermal break frames in the bakery, dining, chapel and second floor corridor in Building 600. Other architectural work includes extending the current Emergency/Outpatient entry vestibule, extending the hospital main entry and adjusting the hold-open devices on the emergency vestibule doors to reduce the amount of time both doors are open. It also includes installing occupancy sensors in the 1975 addition office to control the lights.

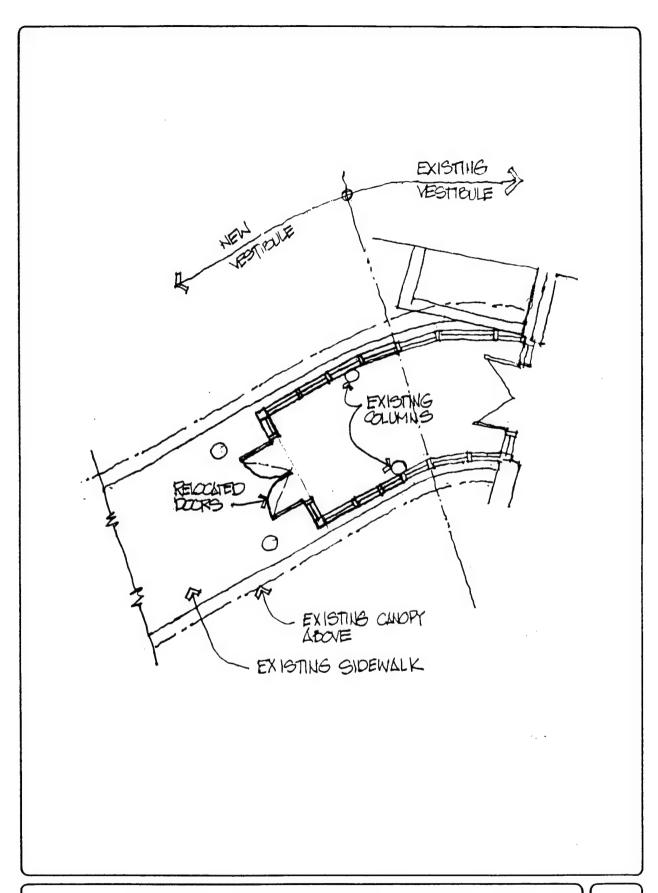
functional requirements summary, PDB-1



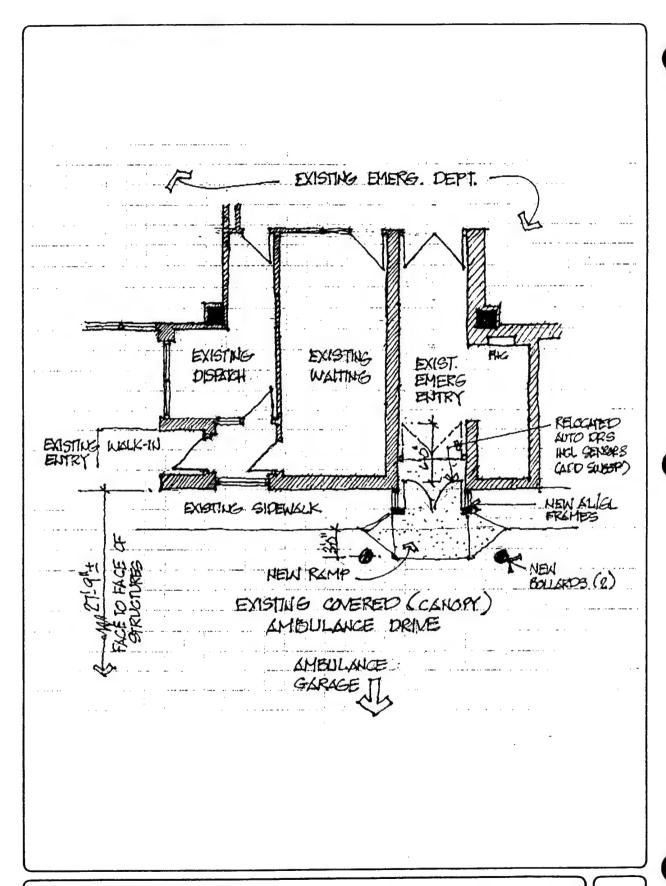
functional requirements summary, PDB-1



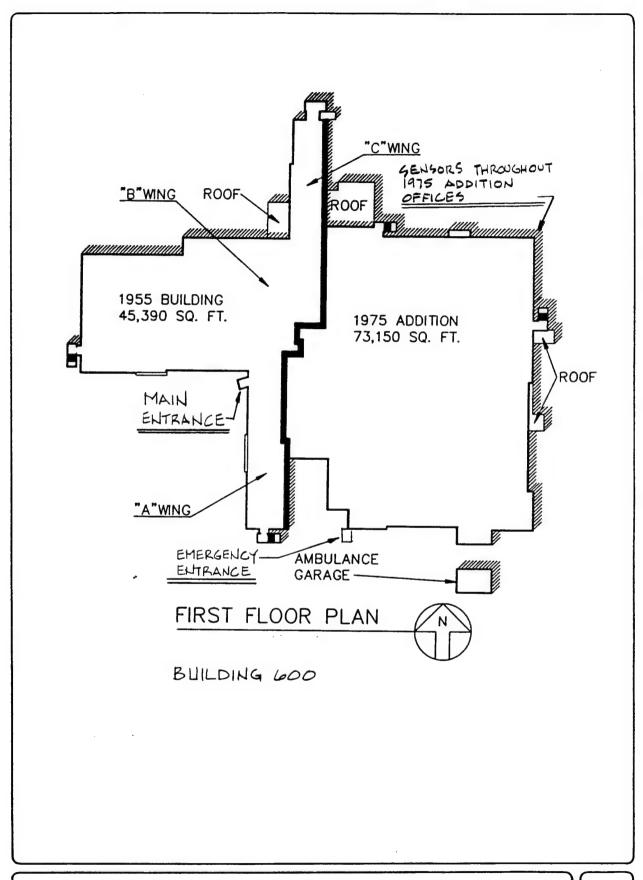
facilities requirements sketch, PDB- $\frac{1}{2}$



facilities requirements sketch, PDB- ½



facilities requirements sketch, PDB- ½



facilities requirements sketch, PDB- 1/2

A. SPECIAL CONSIDERATIONS

	ITEM	Require Not Req	To Be Determi	Commer Attached	Docume
A-1	Cost estimates for each primary and supporting facility	1 No.			1
A-2	Telecommunications system coordination with USACC and authorization for exceptions	N.			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse ecoordination, etc.)				
A-4	Assignment of airspace				
A-5	Economic analysis of alternatives	1			
A-6	Approval for new starts	112	L		<u></u> .
A-7	International balance of payments (180P) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	1.1-			
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	115			
A-9	Exceptions to established criteria	11-			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	N.			
A-11	Identification of related or support projects (so projects can be coordinated)	NI			
A-12	Required completion date	117			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project.

Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED - Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designe

E — Other (Check Comments Attached and explain)

documentation checklist

B. SITE DEVELOPMENT

.	OTTE DE VEED MENT	Required or	To Be *	hent bed	Document
	ITEM	Req.	To B.	Comment Attached	Docu
B-1	Consultation with the District Office to determine and evaluate flood plain hazards				
		NE.			
8-2	Preparation, submission, and/or approval of new				
A)	General Site Plan	-11:15	<u> </u>		
B)	Annotated General Site Plan		l		_
2)	Sketch Site Plan				
D)	Facilities Requirements Sketch	15			
.3	Preparation of				
2 _	Site Survey	1 45			1
1)	Subsoil information	1112	-		
4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan	NZ			
\top	Other Site Development Considerations (List and number items)	11/2			
					l
	· •				

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

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DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

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- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

documentation checklist

C. ARCHITECTURAL & STRUCTURAL

	Req	- E	ched	Ched	
ITEM		To B Dete	Com	Doc	
Reconciliation with troop housing programs and requirements					
Evaluation of existing facilities (including degree of utilization)	112				
Approval for removal and relocation of existing useable facilities					1
					1
					-
					1
					_
Coordination air traffic control and navigational aids with USACC			L		_
Tabulation of types and numbers of aircraft	I				_
Evaluation of laboratory, research and development, and technical maintenance facilities					-
	I	l			_
Review food service facilities by USATSA					_
Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	-				
Coordination postal facilities with U.S. Postal Service Regional Director					_
	112				
	1				_
Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also I tem B-4)	ME.				
Analysis of deficiencies	1 100				_
Consideration of alternatives					-
Determination whether occupants will include physically handicapped or disabled persons				ļ	_
	112			l	4
	NE		ļ	ļ.——	-
Other Architectural & Structural (List and number items)					
	Reconciliation with troop housing programs and requirements Evaluation of existing facilities (including degree of utilization) Approval for removal and relocation of existing useable facilities Evaluation of off-post community facilities Storage and maintenance facilities (including nuclear weapons) Coordination hospitals, medical and dental facilities with Surgeon General Coordination of aviation facilities with FAA Coordination air traffic control and navigational aids with USACC Tabulation of types and numbers of aircraft Evaluation of laboratory, research and development, and technical maintenance facilities Coordination chapels with Chief of Chaplains Review food service facilities by USATSA Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities Coordination postal facilities with U.S. Postal Service Regional Director Laundry and dry cleaning facilities coordination with ASD(I&L) Tenant facilities coordination with installation where sited Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4) Analysis of deficiencies Consideration of alternatives Determination whether occupants will Include physically handicapped or disabled persons As-build drawings for alterations or additions Availability of Standard Design or site adaptable designs	Reconciliation with troop housing programs and requirements Evaluation of existing facilities (including degree of utilization) Approval for removal and relocation of existing useable facilities Evaluation of off-post community facilities Storage and maintenance facilities (including nuclear weapons) Coordination hospitals, medical and dental facilities with Surgeon General Coordination of aviation facilities with FAA Coordination of aviation facilities with FAA Coordination of types and numbers of aircraft Evaluation of laboratory, research and development, and technical maintenance facilities Coordination chapels with Chief of Chaplains Review food service facilities by USATSA Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities Coordination postal facilities with U.S. Postal Service Regional Director Laundry and dry cleaning facilities coordination with ASD(I&L) Tenant facilities coordination with installation where sited Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4) Analysis of deficiencies Consideration of alternatives Determination whether occupants will Include physically handicapped or disabled persons	Reconciliation with troop housing programs and requirements Evaluation of existing facilities (including degree of utilization) Approval for removal and relocation of existing useable facilities Evaluation of off-post community facilities Storage and maintenance facilities (including nuclear weapons) Coordination hospitals, medical and dental facilities with Surgeon General Coordination of aviation facilities with FAA Coordination air traffic control and navigational aids with USACC Tabulation of types and numbers of aircraft Evaluation of laboratory, research and development, and technical maintenance facilities Coordination chapels with Chief of Chaplains Review food service facilities by USATSA Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities Coordination postal facilities with U.S. Postal Service Regional Director Laundry and dry cleaning facilities coordination with ASD(1&L) Tenant facilities coordination with installation where sited Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4) Analysis of deficiencies Consideration of alternatives Determination whether occupants will Include physically handicapped or disabled persons As-build drawings for alterations or additions Availability of Standard Design or site adaptable designs	Reconciliation with troop housing programs and requirements Evaluation of existing facilities (including degree of utilization) Approval for removal and relocation of existing useable facilities Evaluation of off-post community facilities Storage and maintenance facilities (including nuclear weapons) Coordination hospitals, medical and dental facilities with Surgeon General Coordination of aviation facilities with FAA Coordination of aviation facilities with FAA Coordination of traffic control and navigational aids with USACC Tabulation of types and numbers of aircraft Evaluation of taboratory, research and development, and technical maintenance facilities Coordination chapels with Chief of Chaplains Review food service facilities by USATSA Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities Coordination postal facilities with U.S. Postal Service Regional Director Laundry and dry cleaning facilities coordination with ASD(I&L) Tenant facilities coordination with installation where sited facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4) Analysis of deficiencies Consideration of alternatives Determination whether occupants will Include physically handicapped or disabled persons As-build drawings for alterations or additions	Reconciliation with troop housing programs and requirements Evaluation of existing facilities (including degree of utilization) Approval for removal and relocation of existing useable facilities Evaluation of off-post community facilities Storage and maintenance facilities (including nuclear weapons) Coordination hospitals, medical and dental facilities with Surgeon General Coordination of aviation facilities with FAA Coordination of taylor and numbers of aircraft Evaluation of types and numbers of aircraft Evaluation of taboratory, research and development, and technical maintenance facilities Coordination chapels with Chief of Chaplains Review food service facilities by USATSA Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities Coordination postal facilities with U.S. Postal Service Regional Director Laundry and dry cleaning facilities coordination with ASD(1&L) Tenant facilities coordination with installation where sited facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4) Analysis of deficiencies Consideration of alternatives Determination whether occupants will Include physically handicapped or disabled persons As-build drawings for alterations or additions

REQUIRED OR NOT REQUIRED — Not relevant or no information to cominunicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available.
Enter code for information source.

COMMENT ATTACHED - Significant information summarized or explained

DOCUMENT ATTACHED - Significant information is in an existing document which is attached. *BY WHOM (Check and insert appropriate letter)

- A DFAE
- B Using Service
- C Construction Service
- $\mathsf{D} = \mathsf{Designer}$
- E Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-C-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

$\overline{\overline{}}$	ITEM	Require Not Rec	To Be Determi	Commer	Docume Attached
D-1	Fuel considerations and cost comparison analysis	115			
D-2	Energy requirements appraisal (ERA)	1			
D-3	Conformance with DOD Energy Reduction requirements	112			
D-4		117.			
	Evaluation of existing and/or proposed utility systems Other Mechanical and Utility Systems (List and number items)				

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED - Significant information summarized or explained

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E — Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

		Require	To Be Determ	Comme	Docum Attache
	ITEM	_	Få	8 4	Q ₹
	mpact assessment	MZ			
	require Environmental Impact Statement			ļ	
health, environme the Office of the S	health, environmental or related hazards. Assistance to determine existence of am lental or related hazard may be requested from Aberdeen Proving Ground, MD 210 Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)	10.			
E-4 Air/water polluti state and local let	tion permit, coordination with agencies and compliance with standards at Feder evel	115.			
E-5 Corrective measure assessment—list	ures associated with Environmental Impact Statements or separately and evaluate.	: 1 <u>.</u>			
Other environmen	intal considerations (list and number items)				

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project.

Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently evailable. Enter code for information source.

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*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E - Other (Check Comments Attached and

explain)

documentation checklist

A. SPECIAL CONSIDERATIONS

\equiv	ITEM	Required Not Req	To Be Determin	Commen	Docume Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	17			
A-2	Construction phasing requirements	1 5			
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	1,15			
A-4	Equipment in place and justification				
A-5	Other equipment and furniture (O&MA, OPA) and costs	11=			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)				
A-7	Type of construction (permanent, temporary, semi-permanent)	112			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	115			
	Other special considerations (list and number items)				

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project.

Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

B. SITE DEVELOPMENT

В.	SITE DEVELOPMENT	Required or Not Required	To Be • Determined	nent hed	ment
	ITEM	Requi	To Be Deter	Comment	Document Attached
B-1 (A)	Construction restrictions or guidelines pertaining to site access and preferred construction routes	·]=.			
(B)	Airfield clearance, explosive storage, working hours, safety, etc.	113.			
(c)	Facilities and/or functions or adjoining areas (structures, materials, impact)	MZ			
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)	NE			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/ chemical contamination/asbestos emissions/toxic gases	113			
(8)	Restrictions on disposal of demolished/relocated material including hazardous waste	N3			
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NZ			
B-5	Landscape considerations Protection of existing vegetation	NZ			
(8)	Stockpile topsoil	NR			
	Other Site Development (List and number items)	NR.	-		

REQUIRED OR NOT REQUIRED - Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelavant and is not required for this project.

TO BE DETERMINED - Information needed but not currently available. Enter code for information source.

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- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and expiain)

C. ARCHITECTURAL & STRUCTURAL

(TFI)	Required Not Required	To Be Determine	Comment Attached	Document Attached
ITEM		°°	SÃ	A P
C-1 Vibration-producing equipment requiring isolation	1112			
C-2 Seismic zone and other design load criteria (typhoon, hurricane, eartholoss potential)	quake loads, high or low			
C-3 Protective shelter evaluation and resistant design criteria (conventional tion, chemical/biological)				
C-4 Unusual foundation requirements (pier, pile, caisson, deep foundations permafrost areas, soil bearing)	s, mat, special treatment,			
C-5 Designation and strength of units to be accommodated	NZ			
C-6 Requirements and data for special design projects	行	·		
C-7 Unusual floor and roof loads (safes, equipment)				_
C-8 Security features (arms rooms, vaults, interior secure areas)				
Other Architectural & Structural (List and number items)	NK			

REQUIRED OR NOT REQUIRED - Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

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- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

	ITEM	Required Not Requ	To Be Determin	Commen	Documer Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	1:-			
D-2	Special peak usage periods and peak leveling techniques				
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	1			
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)				
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)				
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)				
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)				
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	172			
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	NE			
D-10	Solar energy evaluation	110			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently evailable. Enter code for information source.

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*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E — Other (Check Comments Attached and explain)

Required or Not Required **E. ENVIRONMENTAL CONSIDERATIONS** ITEM VF Waste water treatment, air quality, and solid waste disposal criteria E-1 Other Environmental Considerations (List and number items) NZ

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

 $\mbox{COMMENT ATTACHED} = \mbox{Significant information summarized or explained} \\ \mbox{and attached}.$

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E — Other (Check Comments Attached and explain)

Required or Not Required F. FIRE PROTECTION Comment ITEM NR Special fire protection systems or features (detection and suppression equipment, hazards, etc.) F-1 Other Fire Protection Considerations (List and number items) NR

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

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* #BY WHOM (Check and insert appropriate letter)

- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

COST ESTI	COST ESTIMATE ANALYSIS	YSIS			INVITAT	INVITATION/CONTRACTOR	CTOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	RED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.	800-2; the prop	onent egen	ncy is USA	ICE.				January	y 1992		April 1	1992	
PROJECT Irwin Army Community Hospital	Hosp1ta1	- EEAP		•	CODE (Check one)	heck one)	Š	DRAWING NO.			SHEET	\$ 50	SHEETS
LOCATION Fort Pilon Venese					֓֞֞֝֟֝֟֝֟֝֟֝֟֝֟֝֟֟֝֟֟֟ —			ESTIMATOR			CHECKED BY		
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TASK DESCRIPTION	NO. OF	UNIT	MH UNIT	TOTAL HR8	PRICE	cost	PRICE	COST	PRICE	C08T	TOTAL	TIND	TOTAL
MODNIN		REPLACEME	EME	NT	FOR	BUIDTING	ING	000					
SHEET 2 0F 5						·					7142		
SHEET 3 OF 5											4.4		
SHEET 4 OF 5											4006		
SHEET 5 OF 5							3				2602		
SUBTOTAL											17891		
CONTEACTOR OH @	1590										2684		
SUBTOTAL											20575		
CONTRACTOR PROFIT	T @ 10%	b									7057		
SUBTOTAL											25022		
CONTINGENCIES (@ 5.5	70									1245		
CONSTRUCTION COST										a	23817		
510H @ 6.0%											1433		
TOTAL THIS SHEET													

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	FE ANAL	(SIS	cy le USA	ς. Ε.	INVITATI	INVITATION/CONTRACTOR	STOR	EFFECTIVE PRICING DATE January 1992	RICING DA	ATE	DATE PREPARED April 1992	1992	
PROJECT Irwin Army Community Hospital	pital –	EEAP			CODE (Check one)	eck one)	٥	DRAWING NO	1.		SHEET ?	9	SHEETS
LOCATION Fort Riley, Kansas						ОТНЕЯ	,	ESTIMATOR			CHECKED BY	1 7	
	QUAR	QUANTITY		-	LABOR		EQ	EQUIPMENT	ž	MATERIAL		15	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	MH UNIT	TOTAL HRS	PRICE	COST	PRICE	1800	PRICE	COST	TOTAL	T.W.	TOTAL
SECOND FLUOR	CORRIDGR	2100	X										
REMOVE EXISTING						•							
2													
MINDOM SECTION													
TOTAL OF 3 SECT.	225	5F			Sp.	210		Ì	1		012		
INSTALL NEW BRONZE	т												
TINTED MINDOWS /W													
THERMAL BREAK &													
I-INCH INSULATING													
4LASS	522	SF			4.81	1083	١		2.57	5670	6753		
CAULK NEW KINDOWS	150	77	1	1	1.01	150	-		0.18	27	179		
TOTAL THIS SHEET											7142		
DA FORM 5418-R, Apr 36													

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	E ANAL	YSIS	cy is USA	S. Fire	INVITAT	INVITATION/CONTRACTOR	CTOR	EFFECTIVE PRICING DATE January 1992	HICING D y 1992	ATE	DATE PREPARED April 1992	RED 192	
PROJECT Irwin Army Community Hospital	pital	- EEAP			CODE (Check one)	leck one)	ا	DRAWING NO	o.		SHEET 3	9 13	SHEETS
iley,						ОТНЕЯ		ESTIMATOR			CHECKED BY	Frvm	a
	AUD	QUANTITY			LABOR		EQ	EQUIPMENT	Ì	MATERIAL	1	ŝ	SHIPPING
TASK DESCRIPTION	NO. OF UNITE	UNIT	MH UNIT	TOTAL HR8	UNIT	COST	PRICE	COST	PRICE	C08T	TOTAL	TIND TW	TOTAL
SECOND FLOOR C	CHAPE		RINDOWS	15									
						•							
1,0-102 × H19-9													
SECTION OF ALUM				<u>.</u>									
MINDOMS	130	SF	ı	1	.93	121	-				121		
INSTALL NEW BRONEE	1.1												
TINTED MINDOLIS/W													
THERMAL BREAK &													
I-INCH INSULATING													
GUASS	130	25	1	1	4.81	628		1	25.2	3276	1068		
CAULK NEW WINDOWS	991	7	i	1	10.1	0	1		0.18	8	<u>-</u>		
TOTAL THIS SHEET											4/41		
DA FORM 5418-R, Apr 85													

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	FE ANALY	SIS ent agent	y is USAC		INVITAT	INVITATION/CONTRACTOR	CTOR	EFFECTIVE PRICING DATE January 1992	RICING D	ATE	DATE PREPARED April 199	1992	
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)	eck one)	٢	DRAWING NO.			SHEET 4	٦ ٩	SHEETS
LOCATION Fort Riley, Kansas] [OTHER	7	ESTIMATOR			12		
	QUANTITY				LABOR		EO	EQUIPMENT	Σ	MATERIAL	, n	SHI	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	TINO	TOTAL	PRICE	COST	PRICE	COST	PRICE	C08T	TOTAL	TW	TOTAL
DINING ROOM WINDOWS	SMO												
CEMOVE EXISTING						-							
8-9"HX 19-6"L PTD													
STEEL FRAME WINDOWS	5 12	EA			52	1	-		1		300		
INSTALL NEW BEONEE													
MINDON UNITS M													
THEEMAL BREAK &													
1-INCH TINTED													
INSULATING GLASS	5	EA	1		30	468			250	3000	3468		
CAULK NEW MINDOWS	200	77			10.1	202			0.18	36	238		
TOTAL THIS SHEET				-							4004		
DA FORM 5418-R, Apr 86													

COST ESTIMATE ANALYSIS For use of this form, see TM 8-800-2; the proponent agency is USACE.	TE ANAL	YSIS	cy is USA		INVITATI	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE January 1992	TIVE PRICING DAT January 1992	ATE 2	DATE PREPARED April 1993	ARED 1992	
PROJECT Irwin Army Community Hospital	pital	- EEAP			CODE (Check one)	eck one)	٥	DRAWING NO.	Ġ		SHEET 5	, P	SHEETS
LOCATION Fort Riley, Kansas						ОТНЕЯ		ESTIMATOR			CHECKED BY	Fromfro	
	AUA	QUANTITY			LABOR		EOL	EQUIPMENT	Š	MATERIAL		\$	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	MH UNIT	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TIND	TOTAL
BAKERY KIINDOMS	.0												
REMOVE 3-6"x 16-0"						٠							
FIXED SASH PAINTED													
STEEL MINDOM UNITS	8	EA		1	52					1	200		
INSTALL NEW BRONZE													
ALUM. WINDOW UNITS													
W/THERMAL BREAK &													
1-INCH TINTED													
INSULATING GLASS	a	EA			39	312			052	2000	2312		
CAULK NEW WINDOWS	25	ファ			10.1	76			0.10	4	96		
TOTAL THIS SHEET											2007	1	
20 A 0 0 4 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0													

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	FE ANAL	YSIS	cy is USA(ų	INVITAT	INVITATION/CONTRACTOR	ctor	EFFECTIVE PRICING DATE January 1992	RICING DA	ATE	DATE PREPARED April 1993	4AED 1992	
PROJECT Irwin Army Community Hospital	pftal	- EEAP			CODE (Check one)	eck one)	٥	DRAWING NO.	o.		SHEET	6	SHEETS
LOCATION Fort Riley, Kansas						ОТНЕЯ		ESTIMATOR			CHECKED BY	Frymire	
	AUA	QUANTITY			LABOR		ΕQ	EQUIPMENT	ž	MATERIAL		8	BHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH UNIT	TOTAL HRS	PRICE	COST	PRICE	1800	PRICE	COST	TOTAL	TN2 TW	TOTAL
SHEET C						-					29,224		
SHEET 3							·				59774		
SUBTOTAL											28,448		
CONTRACTOR OH @	1595	h									15,350		
SUBTOTAL											162,348	1	
CONTRACTOR PROFIT @	7 @	10%									10235		
SUBTOTAL										1	112,583		
CONTINGENCIES	3)	5.590	Ь								2619		
CONSTRUCTION C	Cost										118, 715		
						,							
SIOH @ 6.0 7c											7127		
TOTAL THIS SHEET											125,900	- 0.4	
DA FORM 5418-R, Apr 85													

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COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	E ANAL	SIS ent egend	y Is USA	Ċ.			5	January	.v 1992		April 1992	1992	
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (C)	CODE (Check one)	۲	DRAWING NO.			SHEET 2	8	SHEETS
Hley,					1 _	ОТНЕЯ		ESTIMATOR			CHECKED BY	Fromtre	
	QUAN	QUANTITY			LABOR		EQ	EQUIPMENT	M	MATERIAL	1	18	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH UNIT	TOTAL HR8	UNIT	COST	PRICE	COST	PRICE	COST	TOTAL	TIND	TOTAL
INSULATING GLASS		CREPLACE		KIND	DOW	UNITS -	BUIL	DIN G	(019				
									`				
REMOVE EXISTING													
SINGLE PANE 4 D.H.													
ALUM. MINDOW UNITS													
4 INTERIOR STORM													
MINDOMS	339	EA			5	5085				1	5085		
INSTALL NEW DOUBLE													
HUNG BRONZE TINTED													
ALUM MINDOW UNITS													
W/THERMAL BREAK,													
1-INCH INSULATING													
GLASS & SCREENS	101	EA	1		39	3939	1		200	20,200	20,200 24139		
TOTAL THIS SHEET											29,224		
DA FORM 5418-R. Apr 86													

COST ESTIMATE ANALYSIS For use of this form, see TM 8-800-2; the proponent agency is USACE.	E ANALYSIS	gency le	USACE.	2	VITATIO	INVITATION/CONTRACTOR	CTOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED Anril 1993	ARED	
PROJECT Irwin Army Community Hospital	oital - EE	EEAP		8	CODE (Check one)	ck one)	۲	DRAWING NO.			SHEET 3	20	SHEETS
LOCATION Fort Riley, Kansas				Π		Jothen	1	ESTIMATOR			10	Fromtre	
	TITAND	 - -		LA	LABOR		EQ	EQUIPMENT	Σ	MATERIAL		18	SHIPPING
TASK DESCRIPTION	NO. OF UNIT	ž	UNIT HAS		PRICE	COST	PRICE	1800	PRICE	COST	TOTAL	TW	TOTAL WT
INSTALL 2-INCH													
THICK PROCELEAN													
FINISHED INSULATING													
PANELS (3-0"X 5-0")												-	
IN 238 KINDOMS	3570 SF	77		1	10.6	16,746			12.40	44268	55014		
CALLY NEK KINDOKIS		-		-									
& PANELS	4000 LF				0.	4040			0.18	221	4760		
		\dashv	_										
TOTAL THIS SHEET											54,774		
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y, Kansas V, Kansas V, Kansas V, Kansas V, Kansas OMMITTY CODE CARGE AND V, Kansas OMMITTY CODE CARGE AND CODE CAR	COST ESTIMATE ANALYSIS For use of this form, see TM 8-800-2; the proponent agency is USACE.	TE ANALYSIS	pency is Ut	SACE.	INVITA	-	120A	SFFECTIVE PRICING DATE January 1992	MICING D. Y 1992	NT 6	April 1992	AAED 1992		
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CONTACTIVE CON	ocation Fort Riley, Kansas				Ľ	THER		ESTIMATOR	两		CHECKED BY			T
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1 30F 3 - Su 6 464 / (CENCUES 5.5%) 14 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	TASK DESCRIPTION		ž			C08T	PAICE	1800	PRICE	COST	TOTAL	TINS E	TOTAL	_
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11.	CONSTRUCTION COST										8898.			_
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	TOTAL THIS SHEET										9432			

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PROJECT Irwin Army Community Hospi	Hospital - EEAP	EAP			√ × ×	CODE (Check one)	۲۷	DRAWING NO.	.1		Z 133H8	9	SHEETS
	BINUNI	171	66			ОТНЕЯ		ESTIMATOR	弱		СНЕСКЕО ВУ R. D.	Frymire	•
	QUANTITY	ΙŢΥ			LABOR		6 01	EQUIPMENT	M	MATERIAL		ā	BHIPPING
TASK DESCRIPTION	NO. OF UNITE	MEAS	CNIT	TOTAL	PRICE	1800	PAICE	C08T	PRICE	COST	TOTAL	WT	TOTAL
HISPITAL ENTRY	1637	1181	E	- 61/	11011	1379 7	- 6	CO 112	0				
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SILL PAIR OF EXISTILE													
3472 DL CHIRY DKS													
INCS SIDE & TRAISONI													
4/64175	7 /	57									780		
· EXIEND EXISTING													
IL STOKE FRONT													
SIDEUDIL SYSTEM													
24.0"×10.5"14	OHZ	SF:			3,78	123			12	0880	3547		
· PREP EXISTING											·		
CHEVY STATE AND													
CXRSED EILES OF													
EXTING DUM													
TOTAL THIS SHEET													
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COST ESTIMATE ANALYSIS For use of this form, see TM 8-800-2; the proponent seemey is USACE.	TE ANALYSIS	gency is U		INVITATION/C	INVITATION/CONTRACTOR		EFFECTIVE PRICING DATE January 1992	AICING D. y 1992	17.6	April 1992)10 992	
PROJECT I CAID Army Community Hosp	Hosoital - EEAP	۵		CODE (Check one)	-	۲	DRAWING NO.	1			e W	SHEETS
N 11ev. Kansas		Billiany 60	0	֓֞֞֞֞֞֞֞֞֓֓֓֓֟֟֝֟֝֟֟֟֝֟֟֟֝֟֟֝֟֟֝֟֟֝֟֟֝֟֟֝֟֟ ֓֓	-	,	ESTIMATOR	两		0	Frymlre	
	TITNAUD	_		LABOR		6 00	EQUIPMENT	MA	ATERIAL			BHIPPING
TASK DESCRIPTION	NO. OF UNIT	AM &	TOTAL	PRICE	COST	UNIT	COST	PRICE	COST	TOTAL	TW	TOTAL
LIPSPITEL STITES	841	THUE C	29177/11/2	מתנה	, 4.							
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Stous-part-each to								·				
RECEILE NEW CORTR.	1 15	C								620.		
MILLY ELECTRICAL												
KENSTAIS	87 1									400.		
								SUE	SUBTOTAL	5397		
SHECONTRUCTORS FIH	158						·			810		
SUBCONTRACTORS DRUFTI	201									540		
										6747		
Minis controcates CH	25/									1013		
plaine contractors profit	901									519		·
Sub 424	. .				CON	STRUC	CONTRUCTION COST		TOTAL	8,434		
TOTAL THIS SHEET												
DA FORM SAIRE, And SE												

DA FORM SAIB-R, Apr 86

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	FE ANAL	/SIS	cy le USA	Se.	INVITATI	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE January 1992	rive Pricing Dat January 1992	ATE 2	DATE PREPARED April 1992	160	
PROJECT	1047	- t			CODE (Check one)	eck one)	۲	DRAWING NO			1	4	9
TENTIL ATING COMMUNITER DOSPICAL	- 1	FEAR			⟨	_	, 1					5	2
Fort Riley, Kansas					[отнея		ESTIMATOR			CHECKED BY	Frvm1re	ø
	QUA	QUANTITY			LABOR		EQ	EQUIPMENT	W	MATERIAL	1	S	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	MH UNIT	TOTAL HR8	UNIT	COST	PRICE	C08T	PRICE	COST	TOTAL	TW	TOTAL
ECO 26													
STEEL BOLLALDS-2											200		
RELOC. ENTRY DOONS											000		
ADD ENTRY											250		
NEW SIDE LITE											700		
RELOC/AN AND SEKNIS	55					-					350		
SUBTOTAL											7.800		
CONTRACTOR	%SI @ #0	15%									420		
	PEDFITO 106	7010									280		
SUBTOTAL						,		٠			3500		
%9 HOIS											210		
TOTAL											3710		
TOTAL THIS SHEET													
DA FORM 5418-R, Apr 86													

FORM 5418-R, Apr

COST ESTIMATE ANALYSIS For use of this form, see TM 8-800-2; the proponent agency is USACE.	TE ANAL	YSIS nent egen	ty Is USA	3	INVITAT	INVITATION/CONTRACTOR	CTOR	EFFECTIVE PRICING DATE January 1992	PRICING DA	ATE 2	DATE PREPARED April 1992	RED 1992	
PROJECT Irwin Army Community Hospital	pital -	- EEAP			CODE (C)	CODE (Check one)	۲	DRAWING NO.	o.		SHEET	o.	SHEETS
Location Fort Riley, Kansas						ОТНЕЯ		ESTIMATOR			CHECKED 8Y R. D.	Frymire	0
	QUAI	QUANTITY		-	LABOR		EO	EQUIPMENT		MATERIAL		Š	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	MH UNIT	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL
OCCUPANCY SENSOR 300	300	EA			15	4500			05	25500	30,000		
						•							
CONTRACTOR OH	15%										3415		
" PROFIT	10%			_		٠					260		
50B707AC											32625		
			-										
CONSTRUCTION COST											32625		
							-						
STOH	6%										1957		
TOTAL THIS SHEET											34582		
DA FORM 5418-R, Apr 86													

2. HVAC MODIFICATION

1. COMPONENT ARMY	FY 1	9 95 MILITARY C	ONSTR	UCTION PROJ	ECT DATA	2. DATE 19 APR 1992 14 APR 1992
3.INSTALLATION AND Fort Riley	D LOCA	TION		4. PROJECT TITL ECIP		
Kansas				HVAC Sys	Mod	
5. PROGRAM ELEMEN	Τ	6. CATEGORY CODE	7. PRO.	ECT NUMBER	8. PROJECT C	COST (\$000)
		510 10	40	476	1,050	

9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
PRIMARY FACILITY				844
1975 ADD Mod	EA	1	688798	(689)
1955 Bldg Mod	BD	1	154922	(155)
SUPPORTING FACILITIES				54
Design Cost	LS			(54)
ESTIMATED CONTRACT COST				898
CONTINGENCY PERCENT (10.0%)				90
SUBTOTAL				988
SUPERVISION, INSPECTION & OVERHEAD (6.00%)				59
CATEGORY E EQUIPMENT		1		$\frac{(0)}{047}$
TOTAL REQUEST	1			1,047
TOTAL REQUEST (ROUNDED)	-			(0)
INSTALLED EQUIPMENT-OTHER APPROPRIATIONS	- 1	Į		(0)
			İ	

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Convert air handling units in the 1975 Addition of the hospital to single duct variable volume reheat by installing variable volume boxes and variable frequency drives. Convert the vane axial supply air fans in the 1955 Hospital building to fixed pitch with variable frequency drives. Perform all necessary piping, electrical and support work.

11. REQUIREMENT:

PROJECT:

Modification to existing air handling units and ductwork in the 1975 Hospital Addition to convert to single duct variable volume with terminal reheat and modify the supply air fans in the 1955 Building.

REQUIREMENT:

This project is required to reduce gas energy used by the single duct constant volume reheat system to heat the space air flow and reduce the electrical energy by the reduction of the fan air flow quantities in the 1975 Addition along with reducing the gas and electrical energy due to improved air flow control and less maintenance costs by fan drive replacement in the 1955 Building.

DD FORM 1391

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PAGE NO.



I. COMPONENT

ARMY

FY 19 95 MILITARY CONSTRUCTION PROJECT DATA

2 DATE

19 APR 1992 14 APR 1992

1 INSTALLATION AND LOCATION

Fort Riley Kansas

4 PROJECT TITLE

ECTP

HVAC Sys Mod

S. PROJECT NUMBER

40476

CURRENT SITUATION:

The 1975 Hospital Addition is heated and cooled by six single duct constant volume terminal reheat systems with one unit being 100 percent outside air and another unit being a minimum 40 percent outside air. The reheat system cools the supply air to a minimum temperature and then reheats the air at each zone not calling for cooling. The air handling units are sized for the sum of the peak loads and are generally oversized. The 1955 Hospital building is served by eleven air handling unit systems. Of these eleven systems six are dual duct variable volume units with in-flight adjustable pitch vane axial fans. These fans require continuous maintanance due to the mechanical linkage required for in-flight blade adjustment.

IMPACT IF NOT PROVIDED:

Failure to approve this project will continue the excess energy being used to heat, cool and deliver the supply air throughout the 1975 Addition and 1955 Building and continued excessive maintenance of the fans in the 1955 Building.

ADDITIONAL:

This project complies with the scope and design criteria of CEHSC-FU-M "Energy Conservation Investment Program (ECIP) Guidance," that were in effect June 1991. The project has a Discounted Savings Ratio (SIR) of 1.69 and a simple payback of 5.23 years. The implementation of this project will provide an annual energy savings of 23,979 MBTU and an annual dollar savings of \$188,642.

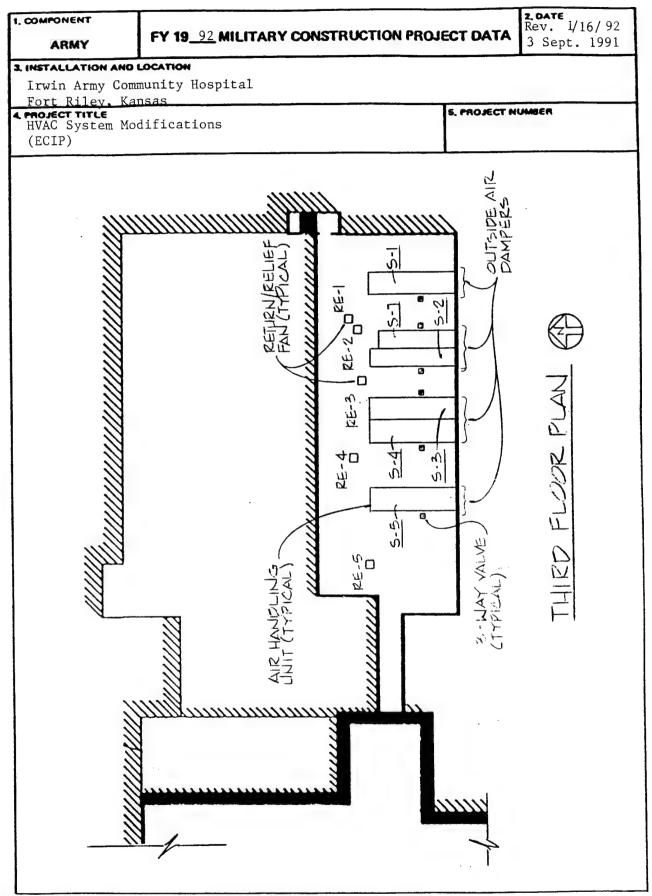
Project validation will be through the use of metering gas flow at the Energy Plant boilers and metering electric consumption at the Hospital. Comparison of total annual gas and electric consumption along with engineering calculations will be utilized.

ı	POTTMATED	CONSTRUCTION START:	APR	1995	INDEX:	1809
		MIDPOINT OF CONSTRUCTION:	OCT	1995	INDEX:	1843
	ESTIMATED	CONSTRUCTION COMPLETION:	APR	1996	INDEX:	1867
1	FOITMATED	CONSTRUCTION COURTERING				

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PAGE NO.



DD FORM 1391c

PREVIOUS EDITIONS MAY BE USED INTERNALLY

PAGE NO.

FOR OFFICIAL USE ONLY

1. COMPONENT

ARMY

FY 19 92 MILITARY CONSTRUCTION PROJECT DATA

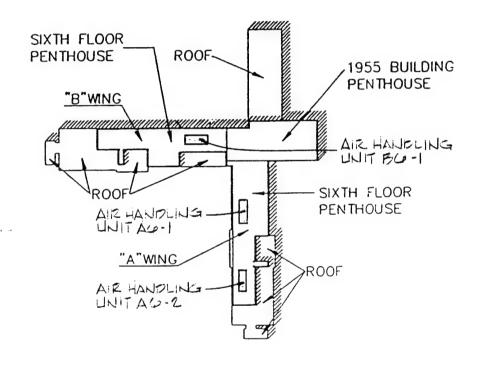
Rev. 1/16/92 3 Sept. 1991

Irwin Army Community Hospital Fort Riley, Kansas

4 PROJECT TITLE

HVAC System Modifications (ECIP)

S, PROJECT NUMBER



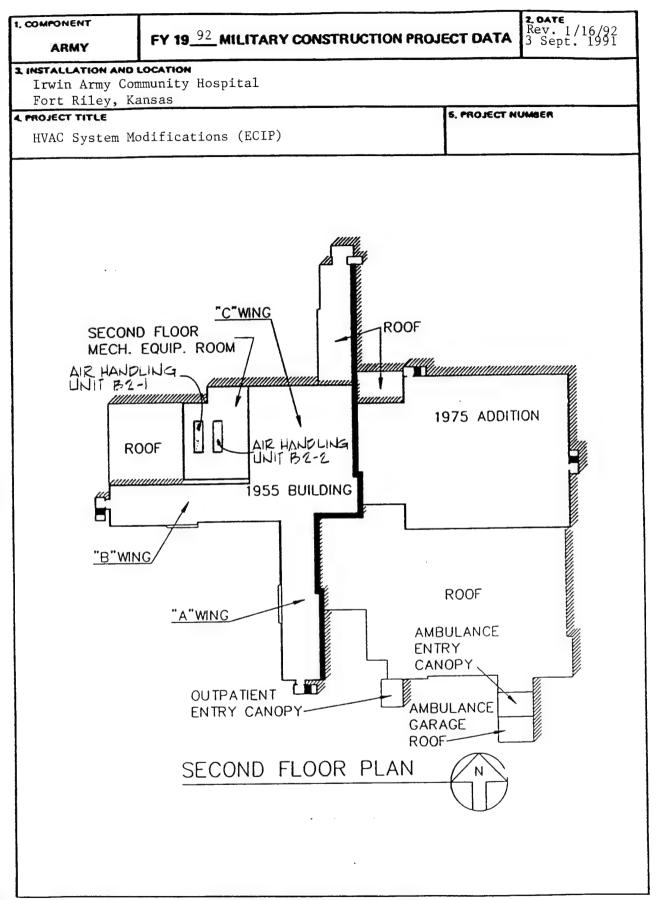
SIXTH FLOOR PLAN



DD FORM 1391c

PREVIOUS EDITIONS MAY BE USED INTERNALLY

PAGE NO.

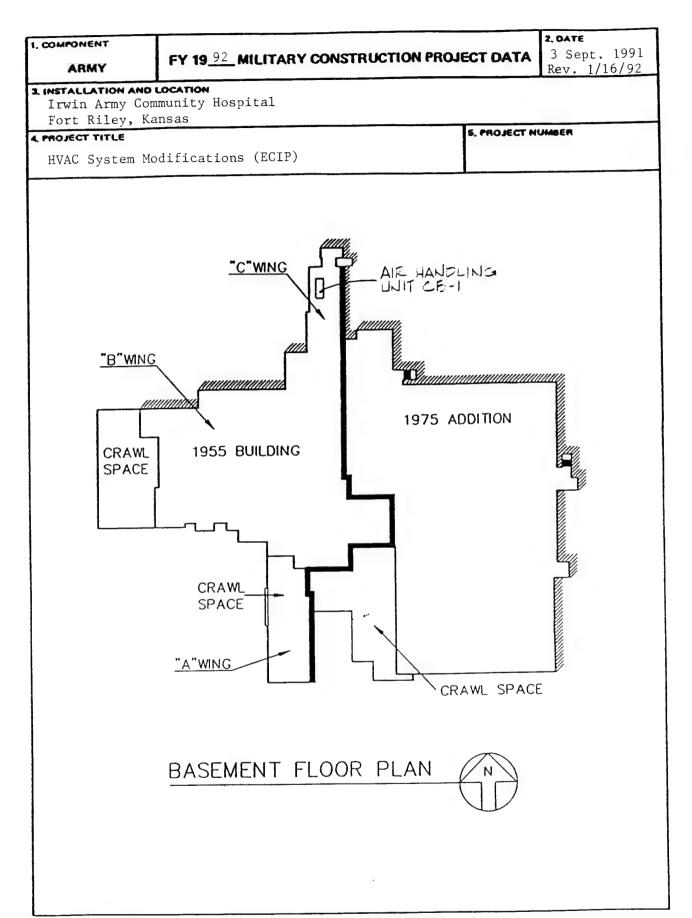


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PREVIOUS EDITIONS MAY BE USED INTERNALLY

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UNTIL EXHAUSTED

PAGE NO.

FOR OFFICIAL USE ONLY

(WHEN DATA IS ENTERED)

INTRODUCTION

The air handling units S-1, S-2, S-3, S-4, S-5 and S-7 located in the 1975 Addition will be converted to single duct variable volume reheat systems by the installation of variable volume boxes with reheat coils in the existing ductwork and variable frequency drives on the air handling units and return/relief Constant volume boxes would need to be installed in areas with specific pressure relationship requirements such as lab, xray and central sterile. S-7 air handling unit will be converted from 100 percent outside air to a minimum outside air with return air to satisfy TM5-838-2 air flow requirements for the areas served. In addition, all air handling unit outside air dampers will be replaced with new low leakage dampers and the chilled water coil 3-way valves will be replaced with new 2-way valves. This modification will result in less gas energy used by the single duct variable volume reheat system since the terminal coils only heat the space minimum air flow required, the outside air quantities have been reduced and the old chilled water valves are replaced with new valves. Less electrical energy will be used by the reduction of the fan air flow quantity and reduction of the refrigeration load in response to the space load diversity. The TRACE 600 program was used to compare the energy consumption of the existing system verses the modified system. The existing system was modeled in base run T0095080 ALT 1 and the modified system was modeled in T00105080 ALT 1.

The supply fans located in the 1955 Building air handling units, A6-1, A6-2, B6-1, B2-1, B2-2 and CB-1 will be modified/converted to fixed pitch vane axial fans with variable frequency drives. The existing air handling units are variable volume type with inflight adjustable pitch vane axial fans. This modification will result in more efficient air flow control for the variable volume units and less maintenance cost. Less gas and electrical energy will be consumed for air flow conditioning due to improved air

flow control. The TRACE 600 program was used to compare the energy consumption of the existing system verses the modified system. The existing system was modeled in base run T0095080 ALT 1 and the modified system was modeled in T0105080 ALT 2.

ASSUMPTIONS

```
District Piping Loses = 10%
Heat Exchanger Efficiency = 80%
Gas\ Cost = $3.7 / MCF
Elect. Cost = $0.038/KWH
1975 ADDITION
    Age of Existing Equipment = 16 years
    Equipment Service Life: (ASHRAE Handbook 1987)
        Diffusers, Grilles & Registers = 27 years
        VAV & Double Duct Boxes = 20 years
        Ductwork = 30 years
        Fans (Centrifugal) = 25 years
        Dampers = 20 years
        Motor Starters = 17 years
1955 ADDITION
    Age of Existing Equipment = 4 years (B6-1, B2-1 & B2-2)
                                3 years (A6-1, A6-2 & CB-1)
    Equipment Service Life: (ASHRAE Handbook 1987)
        Fans (Axial) = 20 years
        Electric Motors = 18 years
```

Motor Starters = 17 years

LIFE CYCLE COST ANALYSIS SUMMARY ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

	Fort Riley, Ks.				CT NO.: 40476
DISCRETE	TTLE: HVAC System PORTION NAME: H	VAC Mod			
ANALYSIS I	DATE: 4-15-92	_ ECONOMIC LIFE	E 11 YEARS	PREPA	RED BY: RDF
B. SIOH C. DESIG D. SALV	TRUCTION COST	+ 1B + 1C - 1D)		\$ 893864 \$ 52632 \$ 52632 \$ 13690	\$ 987438
	SAVINGS (+) / COS S DATE ANNUAL SAV COST \$/MBTU/YR(1)		& DISCOUNTED S ANNUAL \$ SAVINGS(3)	SAVINGS DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC B. DIST C. RESID D. NG E. COAL	\$ 11.13 \$ \$ \$ \$ \$ 3.59 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	10817	\$ 120398 \$ \$ 47251 \$	9.92	\$ 1017365 \$ \$ 468729
F. TOTAL		23979	\$ 167649		\$ <u>1486094</u>
A. ANNU/ (1) DIS	RGY SAVINGS(+)/C AL RECURRING (+/-) SCOUNT FACTOR (TA SCOUNTED SAVING/	ABLE A)	8.44	\$ 1958 \$ 16530	
(1) M.	SAVINGS (+) COST(-)(1) STRTR \$ 6960 MPERS \$ 8520 TAL \$ 15480		DISCOUNT FACTOR(3) 		
C. TOTAL	NONENERGY DISC	DUNTED SAVINGS	(+) / COST (-) (3/	A2+3BD4) \$	178711
(1) 25° a. b. c.	CT NONENERGY QU 6 MAX NONENERGY IF 3D1 IS = OR > 30 IF 3D1 IS < 3C CAL IF 3D1b IS = > 1 G0 IF 3D1b IS < 1 PRO	CALC (2F5 X .33) C GO TO ITEM 4 C S1R = (2F5+3 D TO ITEM 4	\$ 49041 D1) / 1E =		•
4. FIRST YE	AR DOLLAR SAVING	S 2F3+3A+(3B1d	/ YEARS ECONOI	MIC LIFE) \$	188642
	ET DISCOUNTED SA				664805
6. DISCOUN	ITED SAVINGS RATIO	O (IF < 1 PROJEC	CT DOES NOT QU	ALIFY) (SIR) =	(5 / 1E) = 1.69
	PAYRACK PERIOD (F				5.23

CALCULATIONS

Heating and cooling energy can be saved by replacing the air handling unit outside air dampers with new low leakage dampers. The estimated reduction in outside air leakage through the dampers is 5 percent of the total outside air quantity for each unit. The energy savings is as follows:

S-1	350	Winter BIN Temp. = 34.8 deg. F
S-2	300	Winter Space Temp. = 68 deg. F
S-3	315	Summer BIN Enthalpy = 33.2 deg. F
S-4	230	Summer Space Enthalpy = 30 deg. F
S-5	500	
S-7	900	
	2,595 CFM	

Heating Energy Saved Annually

```
2,595 CFM x 1.08 x (68 deg. F - 24.8 deg. F) x 1.1 /
.78 EFF x 4,197 BIN Hrs = 550.7 x 106
550.7 x 106 / 1.031 x 106 BTU/MCF = 550.7 x 106 MCF
```

Cooling Energy Saved Annually

```
2,595 CFM x 4.45 x (33.2 - 30) / 12,000 BTU/Ton = 3.1 tons
3.1 tons x 1,782 BIN hrs x 0.98 KW/Ton = 5,414 KWH
```

Difference in 1975 Addition Energy Consumption

Base run T0095080 Alt 1 annual KWH = 9,339,166

Modified system T00105080 Alt 1 KWH = 6,233,196

Energy saved due to new dampers, KWH = $\frac{+5,414}{3,111,384}$

Base run annual MCF = 52,476.92 x 1.1 / 0.8 = 72,156 Modified system MCF = 43,892.53 x 1.1 / 0.8 = 60,352 Energy saved due to new dampers, MCF = $\frac{+534}{12,338}$

Difference in 1955 Building Energy Consumption

Base run T0095080 Alt 1 annual KWH = 9,339,166

Modified system T0105080 Alt 2 KWH = 9,281,063

58,103 KWH

Base run annual MCF = 541,037 Therms x 0.1×106 = 52,477 1.031×106

Modified system MCF = 537,833 Therms x $0.1 \times 106 = 52,166$ 1.031 x 106

= 311

Due to piping losses and heat exchanger eff.

annual MCF = 311 / 0.8 x 1.1

= 427.63

Total Annual Energy Savings

 $(3,111,384 \text{ KWH} + 58,103 \text{ KWH}) \times 3413 \text{ BTU/KWH} = 10,817.45 \times 106$ $(12,338 \text{ MCF} + 428 \text{ MCF}) \times 1.031 \times 106 \text{ BTU/MCF} = 13,161.8 \times 106$ $23,979.25 \times 106 \text{ BTU/YR}$

Total Annual Dollar Savings

3,111,384 KWH + 58,103 KWH)
$$\times$$
 .038 \$/KWH = 120,440 (12,338 MCF + 428 MCF) 3.7 \$/MCF = $\frac{47,234}{167,674}$ \$/YR

Study period life for this project will be limited to 11 years due to the effective remaining life of the existing equipment to be reused in the modified system. The existing fans in the 1975 air handling units were repaired in 1986 and are estimated to have 20 years remaining. Diffusers, grilles and registers in 1975 Addition are estimated to have 11 years remaining. The equipment in the 1955 Building is only 3 to 4 years old and is projected to have service life beyond 11 years.

Annual Recurring Maintenance for HVAC Systems:

Existing single duct constant volume reheat system, 542.6 tons x \$24/ton = \$13,022.00/year Modified single duct variable volume reheat system, 441.8 tons x \$32/ton = \$14,137.00/year

Annual Recurring Maintenance Cost

$$=$$
 \$13,022.00 - 14,137.00

$$= $ - 1,115.00$$

Nonrecurring expense for the existing 1975 system motor starters will occur in the second year of the study, from cost estimates the motor starter replacement = \$6,960.00

Motor Starters Cost Estimate

5 @ 50 HP = 3,475

1 @ 30 HP = 695

2 @ 15 HP = 950

2 @ 10 HP = 560

1 @ 7.5 HP = 280

Connections = 1,000

\$6,960

Nonrecurring expense for the existing system will occur in the fourth year for the replacement of equipment. From cost estimate damper replacement = \$8,520.00.

Annual recurring maintenance for 1955 Building fan systems are based on manufacturer's recommended procedures. Existing vane axial fans:

- (1) Motor Lubrication 6 @ 1 Hr/Yr x \$38.00/Hr = \$228
- (2) Pillow Block Lub. 6 @ 1 Hr/Yr x \$38.00/Hr = \$228
- (3) Rotor Thrust Brg. Lub. 6 @ 1 Hr/Yr x \$38.00/Hr= \$228
- (4) Handwheel Adj. Lub. 6 @ 1 Hr/Yr x \$38.00/Hr = \$228
- (5) Pitch Chg. Mech. Inspect. -

$$6 \times 12 \ 0 \ 1 \ Hr/Yr \times $38.00/Hr = $2,736$$

- (6) Six Month Inspect. 6 x 2 @ 3 Hr/Yr x \$38.00/Hr = \$1,368
- (7) Rotor Inspection 6 @ 4 Hr/Yr x \$38.00/Hr = \$912
- (8) Blade Bearing Inspect. 6 @ 8 Hr/Yr x \$38.00/Hr= \$1,824 \$7,752

Fixed Pitch Fans with Frequency Drives:

- (1) Motor Lubrication 6 @ 1 Hr/Yr x \$38.00/Yr = \$228
- (2) Pillow Block Lub. 6 @ 1 Hr/Yr x \$38.00/Yr = \$228
- (3) Six Month Inspect. 6 x 2 @ 3 Hr/Yr x \$38.00/Yr = $\frac{$912}{}$

Annual Recurring Maintenance Difference

$$= $7,752 - $1,368$$

= \$6,384

Maintenance cost associated with belt inspection and tightening are assumed the same for both systems.

Total Annual Recurring Maintenance Savings

6,384 - 1,115 = 5,269 \$/YR

Total Annual Nonrecurring Savings

8,520 + 6,960 = 15,480\$/YR

Total Annual Nonenergy Savings due to reduction in electric capacity charge (demand) calculated using the electric rate schedule.

	EXISTING S	YSTEM	MODIFIE	D SYSTEM	
MONTH	BILLING DEMAND	DEMAND CHARGE	BILLING DEMAND	DEMAND CHARGE	SAVINGS
	(KVA)	(dollars)	(KVA)	(dollars)	
JANUARY	1023	4303.15	1007	4238.35	\$ 64.80
FEBRUARY	1022	4299.10	770	3278.50	\$ 1020.60
MARCH	1290	5384.50	948	3999.40	\$ 1385.10
APRIL	1350	5627.50	1023	4303.15	\$ 1324.35
MAY	2166	8932.30	1825	7551.25	\$ 1381.05
JUNE	2507	10313.35	2187	9017.35	\$ 1296.00
JULY	2693	11066.65	2386	9823.30	\$ 1243.35
AUGUST	2655	10912.75	2353	9689.65	\$ 1223.10
SEPTEMBER	2401	9884.05	2103	8677.15	\$ 1206.90
OCTOBER	1407	5858.35	1023	4303.15	\$ 1555.20
NOVEMBER	1281	5348.05	951	4011.55	\$ 1336.50
DECEMBER	1266	5287.30	950	4007.50	\$ 1279.80
TOTAL					\$14,316.75

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	E ANAL	YSIS	cy le USA	CE.	INVITA	INVITATION/CONTRACTOR	ACTOR	EFFECTIVE PRICING DATE	PRICING DA	TE	DATE PREPARED	AED 1992	
PROJECT					CODE /C	CODE (Check one)		DRAWING NO	d .		Samary		
Irwin Army Community Hospital	- 1	- EEAP			×		Ů	HVAC O	SYSTEM	MOD.	SHEET	0 F 6	4 SHEETS
Fort Rilev. Kansas					Ľ	ОТНЕЯ		ESTIMATOR	KIAB		CHECKED BY	F	
	QUA	QUANTITY			LABOR		EO	EQUIPMENT	MA	MATERIAL		IHS I	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	AH LINO	TOTAL	PRICE	CO8T	PRICE	cost	PRICE	COST	TOTAL	TW	TOTAL
SHEET C OF 4											288, 265		
SHEET 5 OF 4							·				144,300		
SHEET 4 OF 4											96,900		
SUBTOTAL											524,465		
SUBCONTRACTOR OHE	1570										79,420		
SUBCONTRACTOR PROPITE	TRE	1070									69889		
SUBTOTAL											669,774		
GEN. CONTRACTOR OHE	y 15%										100,466		
GEN. CONTRACTOR PROFIT	છ	1090									77,024		
SUBTOTAL											247.264		
CONTINGENCIES @ 5	5.590										46,600		
CONSTRUCTION COST	BASE	1 0	NO	MEAN 5		1992 C	cost.				893,864	1	
510H & 670											53,630		
TOTAL THIS SHEET											947,496		

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	FE ANAL	YSIS nent egen	cy is USAC	j.	INVITAT	INVITATION/CONTRACTOR		EFFECTIVE PRICING DATE January 1992	SCTIVE PRICING D	ATE	DATE PREPARED January	1 60 CV 1992	
PROJECT Irwin Army Community Hospital	pital .	- EEAP			CODE (Check one)	eck one)	٥	HYAC SYSTEM	STEM	Mob.	SHEET 2		SHEETS
iley,						OTHER	,	ESTIMATOR KIAB	IAB		CHECKED BY R. D.	Frvmfre	a
	AUA	QUANTITY			LABOR		ΕOΙ	EQUIPMENT	Σ	MATERIAL		SH	SHIPPING
TASK DESCRIPTION	NO. OF UNITS	MEAS	TINO	TOTAL HR8	UNIT	COST	PRICE	COST	UNIT	1800	TOTAL	F T X	TOTAL WT
REPLACE O.A. DAMPERS													
INCLUDING OPERATORS						·							
ON 6 AHU'S IN 1975													
1300 (344 \$ TOTAL)		2	I		1	0002		100		0249	0250		
REPLACE CHW 3-WAY													
VALYES M/2-MAY	9	EA		1	99.911	700	2.33	4-	B16.66	B16.66 4900	5614		
REPLACE REHEAT COILS													
MITH VAY BOXES IN													
REHEAT	121	Æ A	1		9991	43,100	_	431	205	500 215,500 259,03	150,627		
TEMP CONTROLS	_	<i>s</i> ₁	-			10,000		991	-	0005	15,100		
	,												
TOTAL THIS SHEET											202,000		
DA FORM 5418-R. Apr 86													

Total			000	,		
Track of the control of the contro		Janue	January 1992	J	January 1992	
Fort Riley, Kansas	L	HYAC SYSTEM	STEM MOD.). SHEET	3 0 4	SHEETS
TASK DESCRIPTION OUNTST WINT LABOR COST PRICE LABOR COST PRICE] #	ESTIMATOR	MAB	CHECKED BY	1.	
FUENISH & INSTALL VARIABLE FREG. DRIVES 1975 ADDITION HVAC 50 HP 30 HF 10 HP 7 EA — 1000 5000 10 HP 7 EA — 1000 7000 10 HP 7 EA — 1000 1000 10 HP 8 FA — 1000 1000 10 HP 1 EA — 1000 1000 10 HP 8 FA — 1000 1000 10 HP 1 EA — 1000 1000 10 HP 8 FA — 1000 1000 10 HP 9 FA — 1000 1000 10 HP 11 EA — 1000 1100 10 HP 11 EA — 1000 1100 10 HP 11 EA — 1000 1100		EQUIPMENT	MATERIAL		7: 7: 7	SHIPPING
FURNISH & TNSTALL VARIABLE FREG. DRIVES 1975 ADDITION HVAC 50 HP 30 HF 10 HP 10 HP 10 HP 7 EA — — 1000 3000 10 HP 10 HP 7 EA — — 1000 3000 10 HP 10 HP 10 HP 11 EA — — 1000 1000 1000 WADIFY 1955 BLDGA VANE AXIAL FAN 11 EA — — 100 1100 1000	COST	COST	PRICE	ST TOTAL	L K	TOTAL
VARIABLE FREG. DRIVES 9 1915 ADDITION HVAC 6 50 HP 5 EA — 1000 5000 30 HF 1 EA — 1000 1000 15 HP 2 EA — — 1000 2000 10 HP 2 EA — — 1000 2000 MODIFY 1955 BLDGA 1 EA — — 1000 1000 KOTORS 11 EA — — 100 1100 -						
1975 ADDITION HVAC 50 HP 50 HF 1 EA 1000 5000 10 HP 10						
30 HF 5 EA — — 1000 5000 30 HF 1 EA — — 1000 1000 15 HP 2 EA — — 1000 2000 10 HP 2 EA — — 1000 2000 10 HP 2 EA — — 1000 2000 17 HP 1 EA — — 100 1000 AXIAL FAN 11 EA — — 100 1100						
30 Hr	2000	200	1900 95,000	000 100,500	000	
15 HP	1000	991	000'21 00021	000 13,100	99	
10 HP	2000	002	21 0009	12,000 14,200	00	
7/2 HP	2000	002	78 0004	20001 0008	90	
FY 1955 BLDGA AXIAL FAN RS 11 EA 100	9991	001	3000 30	3000 4,100	Ų	
FY 1955 BLDGA AXIAL FAN 11 EA 10D ES				_		
AXIAL FAN 11 EA 100						
EA						
			11 901	1100 2200	0	
TOTAL THIS SHEET				144,300	2005	

DA FORM 5418-R, Apr 86

COST ESTIMATE ANALYSIS	TE ANAL	YSIS			INVITATI	INVITATION/CONTRACTOR		EFFECTIVE PRICING DATE	RICING D.	ATE	DATE PREPARED	1E D	
For use of this form, see TM 5-800-2; the proponent egency is USACE.	?; the propo	nent egen	cy Is USA	ĴĒ,				Janua	ry 199.	C1	Janue	January 1992	2
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)	eck one)	υ	HYAC SYSTEM M	STEM	MOP.	SHEET 4	9. 4	SHEETS
LOCATION Fort Riley, Kansas						ОТНЕЯ		ESTIMATOR	MAB		CHECKED BY R. D.	Fromfre	0
	QUAP	QUANTITY			LABOR		EQU	EQUIPMENT	W	MATERIAL		\$	SHIPPING
TASK DESCRIPTION	NO. OF UNITS	UNIT	MH UNIT	TOTAL	PRICE	COST	UNIT	COST	PRICE	COST	TOTAL	TW	TOTAL
FURNISH & INSTALL													
VARIABLE FREG. DRIVES													
1955 BLOY Ab-1, Ab-2,													
36-1, 32-1, 622 1 28-1													
30 HP	1	EA			2002	4000	001	200	200'01	20,000	24,200		
25 HP	4	EA			2000	0000	8	400	020'01	10,000 40,000	48,400		
20 HD	2	EA			2000	4000	001	200	200L	7000 14,000	18,200		
15 HP	_	EA			9991	0001	100	100	9995	5,000	91100		
									-				
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2 - V G 677 100 2 4 4 4													

DA FORM S418-R, Apr 85

20

ANNUAL HEATING BIN

BIN CALCULATED FOR FT. RILEY/MARSHALL DAF ANNUAL TOTAL OBSERVED NUMBER OF HOURS.

BIH	AVG TEMP	Hours	°F Hours
50/54 45/49 40/44 35/39 30/34 25/29 10/14 5/9 -5/-1 -10/-6	5274273272727238	568 5552 6572 723 141 4197	29588 25,286 23,310 22,644 19,072 12,744 1,194 3,791 1,672 863 -632 145,984
		47111	179,104

AVERAGE WINTER TEMPERATURE
145,984 °F HRS ÷ 4197 HRS = 34,8 °F

ANNUAL COOLING BIN

BIN CALCULATED FOR FT RILEY/MARSHALL AAF ANNUAL TOTAL OBSERVED NUMBER OF HOURS.

BIH	AVG	HOURS	°F
	TEMP		HOURS
15/19	77	667	51,359
80/84	82	520	42,640
85/89	87	327	28449
90/94	92	182	16744
95/99	97	ldo	6402
100/104	102	20	2040
,		1782	147,634

AVERAGE SUMMER TEMPERATURE

147,634 - 1,782 = 82.8 °F dB

69 °F MEAN COINCIDENT WET BULE

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 1 EXISTING EQUIPMENT COMBINED COMPLEX

	ELEC	DEMAND		
	On Peak	On Peak	GAS	WATER
Month	(kWh)	(kW)	(Therm)	(1000 GL)
Jan	520,560	1,023	122,964	129
Feb	469,624	1,022	98,947	117
March	574,069	1,290	66,786	169
April	619,115	1,350	43,629	384
May	907,854	2,166	1,030	1,172
June	1,066,403	2,507	3,416	1,730
July	1,249,361	2,693	7,595	2,269
Aug	1,208,242	2,655	6,638	2,115
Sept	946,409	2,401	364	1,340
Oct	679,523	1,407	35,425	499
Nov	551,683	1,281	70,091	158
Dec	546,322	1,266	84,152	149
Total	9,339,166	2,693	541,037	10,230

Building Energy Consumption = 235,380 (Btu/Sq Ft/Year)

Source Energy Consumption = 417,725 (Btu/Sq Ft/Year)

Floor Area = 365,275 (Sq Ft)

Trane Air Conditioning Economics
By: MASSAGLIA-NEUSTROM-BREDSON

TO105080 ALT

V 600 PAGE 2

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 1

ECO 23 REPLACE TRH WITH VRH IN 1975

------ MONTHLY ENERGY CONSUMPTION -----

	ELEC	DEMAND		
	On Peak	On Peak	GAS	WATER
Month	(kWh)	(kW)	(Therm)	(1000 GL)
Jan	330,551	887	116,390	129
Feb	298,067	768	92,448	117
March	383,856	947	55,721	168
April	423,064	1,023	28,846	190
May	612,055	1,905	974	617
June	717,796	2,266	0	1,019
July	825,328	2,465	2,164	1,432
Aug	827,178	2,430	2,345	1,343
Sept	637,095	2,179	0	748
Oct	444,107	1,023	19,809	228
Nov	363,886	949	59,448	158
Dec	370,215	949	74,386	148
Total	6,233,196	2,465	452,532	6,297

Building Energy Consumption =
Source Energy Consumption =

182,129 (Btu/Sq Ft/Year)

305,148 (Btu/Sq Ft/Year)

Floor Area = 365,275 (Sq Ft)

ONTHLY ENERGY CONSUMPTION - ALTERNATIVE 2 ECO 38 REPLACE FANS IN 1955 AHUS

------ MONTHLY ENERGY CONSUMPTION -----

	ELEC	DEMAND		
	On Peak	On Peak	GAS	WATER
Month	(kWh)	(kW)	(Therm)	(1000 GL)
Jan	520,202	1,143	122,628	129
Feb	469,509	1,024	98,634	117
March	574,200	1,291	66,430	168
April	631,352	1,350	43,169	381
May	894,788	2,086	1,030	1,170
June	1,050,267	2,428	3,393	1,722
July	1,231,024	2,614	6,976	2,249
Aug	1,189,487	2,578	6,595	2,105
Sept	931,833	2,325	364	1,337
Oct	679,855	1,407	35,053	496
Nov	547,792	1,283	69,710	158
Dec	560,755	1,267	83,851	150
Total	9,281,063	2,614	537,833	10,183

Building Energy Consumption = 233,960 (Btu/Sq Ft/Year) Source Energy Consumption = 415,173 (Btu/Sq Ft/Year)

Floor Area = 365,275 (Sq Ft)

program year category code date 28 August 1991 phone (913) 239-7207 autovon date 20 August 1991 phone (913) 239-2371 autovon date 28 August 1991 phone (816) 426-2782
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autovon
date28 August 1991
phone(913) 239-2371
autovon
date
date

project development brochure, PDB-

facility

IRWIN ARMY COMMUNITY HOSPITAL FT. RILEY, KANSAS

project coordinator for using service

LARRY STILLWAGON
BASE ENERGY OFFICER

functional requirements summary, PDB-1

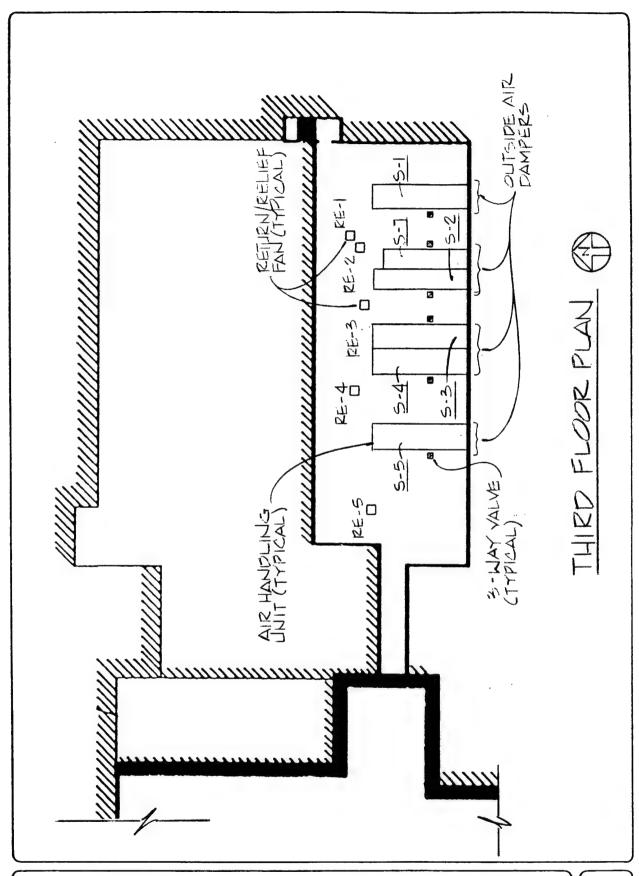
OBJECTIVE

The objective of this project is to convert air handling units S-1, S-2, S-3, S-4, S-5 and S-7 in the 1975 Addition to single duct variable volume reheat by installing variable volume boxes with reheat coils in the present ductwork and variable frequency drives on the air handling units and return/relief fans along with converting air handling unit S-7 from 100 percent outside air to minimum outside air and replacing the outside air dampers on all air handling units with low leakage dampers and all chilled water coil three-way valves with two-way valves.

Also included in this project is to modify the supply air fans A6-1, A6-2, B6-1, B6-2, B2-1, B2-2 and CB-1 in the 1955 Building with fixed pitch vane axial fans and variable frequency drives.

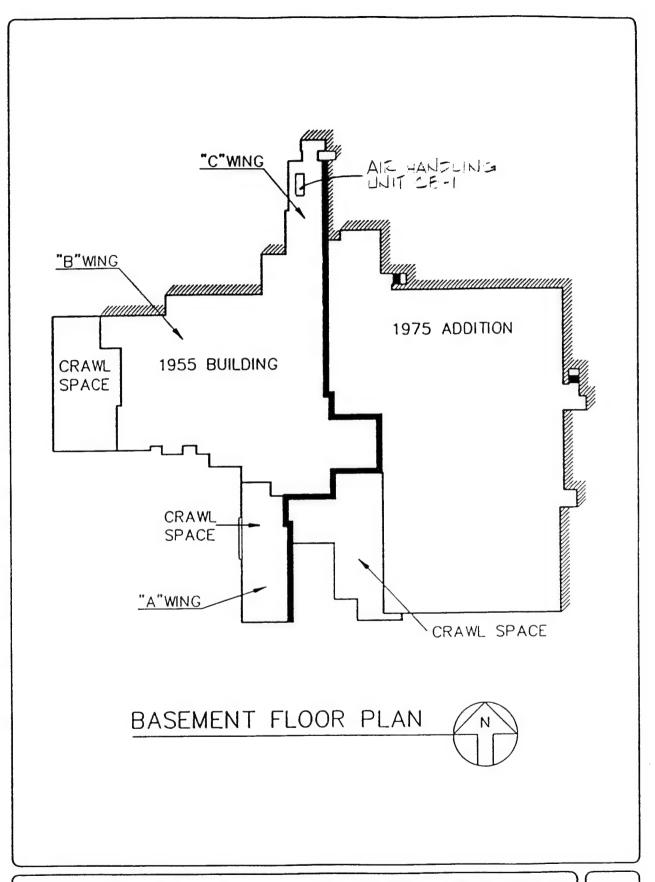
The 1975 Addition part of this project will result in less gas energy used by the single duct variable volume reheat system since the terminal coils only heat the space minimum air flow required, the outside air quantities have been reduced and the old chilled water valves are replaced with new valves. Less electrical energy will be used by the reduction of the fan air flow quantity and reduction of the refrigeration load in response to the space load diversity.

The 1955 Building part of this project will result in more efficient air flow control for the variable volume units and less maintenance cost. Less gas and electrical energy will be consumed for air flow conditioning due to improved air flow control.

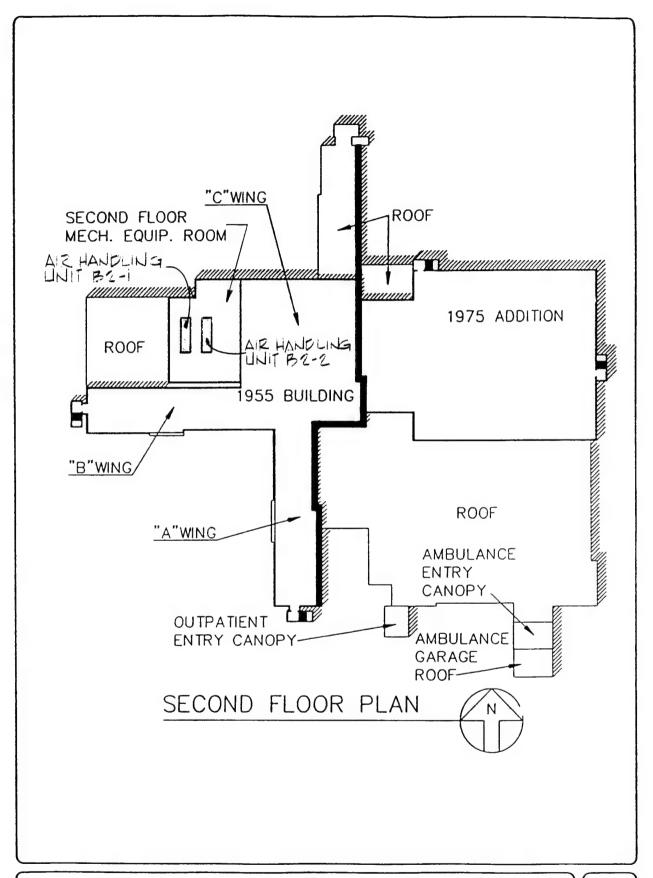


facilities requirements sketch, PDB- ½

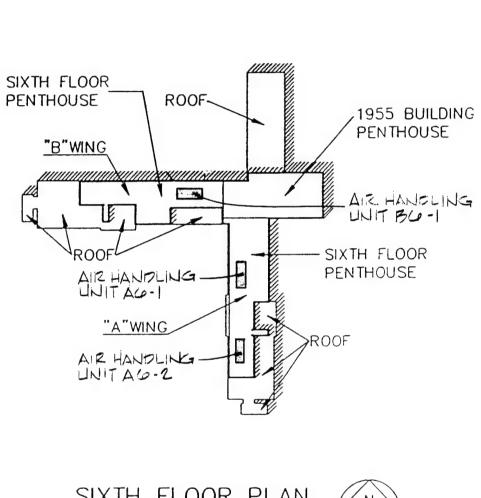
DA FORM 5022-R, Feb 82



facilities requirements sketch, PDB-1/2



facilities requirements sketch, PDB-1/2





facilities requirements sketch, PDB- ½

A. SPECIAL CONSIDERATIONS

	ITEM	Required Not Requ	To Be Determin	Commen	Documen Attached
A-1	Cost estimates for each primary and supporting facility	R			V
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NIZ	i		· · · · · · · · · · · · · · · · · · ·
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse ecoordination, etc.)	NR			
A-4	Assignment of airspace	NR			
A-5	Economic analysis of alternatives	NRNR			
A-6	Approval for new starts	NR			
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	NR			
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	NR			
A-9	Exceptions to established criteria	NR			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	NIZ			
A-11	Identification of related or support projects (so projects can be coordinated)	NY N	<u> </u>	l	
A-12	Required completion date	172			

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 ${\bf COMMENT\ ATTACHED\ -\ Significant\ information\ summarized\ or\ explained\ and\ attached.}$

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E - Other (Check Comments Attached and explain)

documentation checklist

B. SITE DEVELOPMENT

B-2 Preparation, submission, and/or approval of new (A) General Site Plan	N N N Not Required or	To Be Determined	Comment	Document Attached
B-2 Preparation, submission, and/or approval of new (A) General Site Plan	NE			
(A) General Site Plan	NE			
(A) General Site Plan				
	117		 	
(B) Annotated General Site Plan				
(C) Sketch Site Plan	MZ	1_	L_	
(D) Facilities Requirements Sketch	NR		ļ	
B-3 Preparation of				
(A) Site Survey	NZ.		1	
(B) Subsoil information	NR	1		
B-4 Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan		 		
	NE		 	
Other Site Development Considerations (List and number items)	NZ	İ		
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*BY WHOM (Check and insert appropriate letter)

- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and

documentation checklist

DA FORM 5023-B-R, Feb 82

C. ARCHITECTURAL & STRUCTURAL

		p e	Ē	5 B	E 4
	ITEM	Required Not Requ	To Be Determin	Commen	Documen
C-1	Reconciliation with troop housing programs and requirements	NZ			
C-2	Evaluation of existing facilities (including degree of utilization)	III			
C-3	Approval for removal and relocation of existing useable facilities	NE			
C-4	Evaluation of off-post community facilities	115			
C-5	Storage and maintenance facilities (including nuclear weapons)	115			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	113			
C-7	Coordination of aviation facilities with FAA	NZ			
C-8	Coordination air traffic control and navigational aids with USACC	NZ			
C-9	Tabulation of types and numbers of aircraft	115			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	1.12			
C-11	Coordination chapels with Chief of Chaplains	117			
C-12	Review food service facilities by USATSA	NR			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NR			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NR			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	NR			
C-18	Analysis of deficiencies	NZ			
C-19	Consideration of alternatives	NR			
C-20	Determination whether occupants will Include physically handicapped or disabled persons	NZ			
C-21	As-build drawings for alterations or additions	NZ			
C-22	Availability of Standard Design or site adaptable designs	NS	ļ		
	Other Architectural & Structural (List and number items)	NZ			
		1			

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- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-C-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

		ired Popul	i E	ned.	e d
	ITEM	Required Not Requ	To Be Determin	Comment Attached	Documen Attached
D-1	Fuel considerations and cost comparison analysis	115			
D-2	Energy requirements appraisal (ERA)	ME			
	Conformance with DOD Energy Reduction requirements	NJ-			
	Evaluation of existing and/or proposed utility systems				
D-3 D-4	Evaluation of existing and/or proposed utility systems Other Mechanical and Utility Systems (List and number items)				
1					

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- A DFAE
- B Using Service
- C Construction Service
- D Designe
- E Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

E-1 Environmental impect assessment E-2 El A conclusions require Environmental Impact Statement Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazards. Assistance to determine existence of any the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hypiene Agency) E-4 Air/weter pollution permit, coordination with agencies and compliance with standards at Federal, state and local level E-5 Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate. Other environmental considerations (list and number items)	To Be	Determir	Commen	Documer
E-2 EI A conclusions require Environmental Impact Statement E-3 Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency) E-4 Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level E-5 Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.				
E-3 Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency) E-4 Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level E-5 Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.				
State and local level N E				
assessment—list separately and evaluate.				
Other environmental considerations (list and number items)				

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*BY WHOM (Check and insert appropriate letter)

- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-E-R, Feb 82

A. SPECIAL CONSIDERATIONS

\geq	ITEM	Required Not Req	To Be Determi	Commer	Docume Attacher
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable			01	-
	area averages	117_			
A-2	Construction phasing requirements		.		
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in		.		
A-4	Equipment in place and justification	1. 1. <	.\		
A-5	Other equipment and furniture (O&MA, OPA) and costs	115			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	11-			
A-7	Type of construction (permanent, temporary, semi-permanent)	11=	_		
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	113			
	Other special considerations (list and number items)	NZ			
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*BY WHOM (Chèck and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E — Other (Check Comments Attached and explain)

B. SITE DEVELOPMENT

		Requ	a iii	ment	The check
	ITEM	Required Not Requ	To Be Determine	Comment Attached	Document
8-1	Construction restrictions or guidelines pertaining to				
(A)	site access and preferred construction routes	MZ			<u> </u>
(B)	Airfield clearance, explosive storage, working hours, safety, etc.	NE.			
(c)	Facilities and/or functions or adjoining areas (structures, materials, impact)	77.			
8-2	Real estate actions (acquisition, disposal, lease, right-of-way)	N.S.			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/ chemical contamination/asbestos emissions/toxic gases	NZ			
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste	NR			
8-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NR			
B-5	Landscape considerations				
(A)	Protection of existing vegetation	NR	l		L
(8)	Stockpile topsoil	NE			
	Other Site Development (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project.

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A - DFAE

B - Using Service

C - Construction Service

D - Designer

E — Other (Chack Comments Attached and explain)

C. ARCHITECTURAL & STRUCTURAL

						•
	. ARCHITECTURAL & STRUCTURAL	Required or Not Required	To Be * Determined	nent hed	ment hed	
	ITEM			Comment Attached	Document Attached	
C-1	Vibration-producing equipment requiring isolation	NE	-			
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	2	0			
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)	NE				
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	1413				
C-5	Designation and strength of units to be accommodated	115				1
C-6	Requirements and data for special design projects	NE				İ
C.7	Unusual floor and roof loads (safes, equipment)	117				1
C-8	Security features (arms rooms, vaults, interior secure areas)	117				
	Other Architectural & Structural (List and number items)	NR				

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A - DFAE

B - Using Service

C - Construction Service

E - Other (Check Comments Attached and explain)

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

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	ITEM	Require Not Rec	To Be Determ	Comme	Docume
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	N. Z.			
D-2	Special peak usage periods and peak leveling techniques	NZ			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	12	D		
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	N	D		
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	R	0		
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	2	ジ		
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	7	2		
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	N N N			
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	MZ			
D-10	Solar energy evaluation	NZ			
	Other Mechanical & Utility Systems (List and number items)	NZ	1		
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A - DFAE

B - Using Service

C - Construction Service

D - Designe

E — Other (Check Comments Attached and explain)

E. ENVIRONMENTAL CONSIDERATIONS

$\overline{}$	ITEM	Required Not Req	To Be Determir	Commen	Documer
E-1	Waste water treatment, air quality, and solid waste disposal criteria	NR			
	Other Environmental Considerations (List and number items)	NR			
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*BY WHOM (Check and insert appropriate letter)

- A DFA
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

Required or Not Required F. FIRE PROTECTION To Be * Determined ITEM NR F-1 Special fire protection systems or features (detection and suppression equipment, hazards, etc.) Other Fire Protection Considerations (List and number items) NR

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COST ESTIMATE ANALYSIS	TE ANALYS	SI			INVITATI	INVITATION/CONTRACTOR	CTOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	ED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.	t; the proponer	nt agenc	y is USAC					January	ry 1992	2	January	ry 1992	6:
PROJECT Irwin Army Community Hospital	1	EEAP			CODE (Check one)	eck one)	٥	HVAC S	NO. SYSTEM	Мор.	SHEET	0.0	SHEETS
LOCATION Fort Rilev, Kansas						Отнея		ESTIMATOR	KIAB		CHECKED BY	J. wind	
	QUANTITY			1	LABOR		EQ	EQUIPMENT	M	MATERIAL	1	IHS SHI	SHIPPING
TASK DESCRIPTION	NO. OF UNITS N	MEAS	MH	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL
SHEET 2 OF 4											288,265		
SHEET 3 OF 4						•					144,300		
SHEET 4 OF 4											36,900		
SUBTOTAL											529,465		
SUBCONTRACTOR OHG	15 70										79,420		
\$ SUBCONTRACTOR PROP	PROPIT @ 1	1070									60,000		
SUBTOTAL											669,774		
GEN. CONTRACTOR OH	15%										100,466		
GEN. CONTRACTOR PRO	PROFIT @ 16	1090									77,024		
SUBTOTAL											247,264		
CONTINGENCIES @	5.590										46,600		
CONSTRUCTION COST	BASED	0	z	MEANS	1992	. 20ST.					893,844		
510H & 670	·										53,632		
TOTAL THIS SHEET											947,496		

COST ESTIMATE ANALYSIS	TE ANA!	YSIS			INVITAT	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	ED	
use of this for	; the prop	onent egen	cy is USA	CE.				January	rry 1992	2	Janı	January 1992	92
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	QUA	QUANTITY			LABOR		EOL	EQUIPMENT	Z	MATERIAL	1	IHS SHI	SHIPPING
TASK DESCRIPTION	NO. ON UNITS	MEAS	MH UNIT	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL
REPLACE O.A. DAMPERS													
INCLUDING OPERATORS													
ON 6 AHU'S IN 1975													
1300 (344 # TOTAL)	_	15	1			2000		001		6420	0253		
REPLACE CHW 3- WAY													
VALVES M/2-MAY	e	EA			116.66	100	2.33	4	816.66	4900	5614		
REPLACE REHEAT COILS													
WITH VAY BOXES W/													
REHEAT	121	EA			0001	43,100	_	431	200	215,500	259,031		
TEMP CONTROLS	_	$\frac{7}{v}$		1		10,000		100		2000	15,100		
TOTAL THIS SHEET											592,982	1	

COST ESTIMATE ANALYSIS	TE ANAL	YSIS			INVITATI	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE	RICINGD	ATE	DATE PREPARED	1ED	
use of this for	; the propo	nent agen	cy is USA)E.				January	ary 1992	92	Janua	January 1992	2
PROJECT Truin Army Comminity Hospital		FFAD			CODE (Check one)	eck one)	۲	DRAWING NO. HVAC CYCTEM	•	MDD.	SHEET	20.0	1
	- 1						<u>,</u>	ESTIMATOR	- 1		2		
Fort Riley, Kansas					101	отнея			MAB		R. D.	Frvmire	a
	AUA	QUANTITY		1	LABOR		EOI	EQUIPMENT	Σ	MATERIAL	1	SH	SHIPPING
TASK DESCRIPTION	NO. OF UNITS	UNIT	MH UNIT	TOTAL HR8	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TINO TINO	TOTAL
FURNISH & INSTALL													
VARIABLE FREG. DRIYES	-0												
1975 ADDITION HVAC													
50 HP	5	EA			2001	2000	001	200	19000	19000 95,000	100,500		
30 Hr		EA			1000	9991	991	991	20021	000'21	13,100		
15 HP	2	EA			0001	2000	991	200	2009	12,000	14,200		
dH 01	2	EA		-	0001	2000	201	002	4000	2208	19200		
7/2 HP	_	EA			2001	9991	991	100	3000	300C	4,100		
MODIFY 1955 BLDG													
VANE AXIAL FAN													
ROTORS	=	EA			901	9011			201	9911	0052		
TOTAL THIS SHEET											144,300		

COST ESTIMATE ANALYSIS	TE ANAL	YSIS			INVITAT	INVITATION/CONTRACTOR	ACTOR	EFFECTIVE PRICING DATE	PRICING	ATE	DATE PREPARED	RED	
For use of this form, see TM 5-800-2; the proponent agency is USACE	2; the prop	onent egen	cy is USA	CE.				Janu	January 1992	12	Janua	January 1992	2
Irwin Army Community Hospital	pital	- EEAP			CODE (C)	CODE (Check one)	Č	HYAC SY	S NO.	MDP.	SHEET 4) 10	4 SHEETS
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	QUA	QUANTITY			LABOR		EO	EQUIPMENT	2	MATERIAL		SHI	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	MH UNIT	TOTAL HRS	PRICE	C081	PRICE	1800	PRICE	COST	TOTAL	T TW	TOTAL
FURNISH & INSTALL													
VARIABLE FREG. DRIVES													
1955 BLDG Ab-1, Ab-2,													
B6-1, B2-1, B2-2 4 CB-1													
30 HP	2	EA			2000	4000	100	202	200'01	20200	24,200		
25 HP	4	EA			2000	0000	100	400	020'01	10,000 40,000	48,400		
dH 02	7	EA			2000	4000	100	002	7000	14,000	18,200		
15 HP	-	7			2001	0001	100	001	2000	5,000	9019		
TOTAL THIS SHEET											96,900		

3. BOILER CONTROL

2. DATE 1. COMPONENT 19 APR 1992 FY 19 95 MILITARY CONSTRUCTION PROJECT DATA **ARMY** 14 APR 1992 3. INSTALLATION AND LOCATION 4. PROJECT TITLE ECIP Fort Riley Boiler Controls Kansas 8. PROJECT COST (\$000) 7. PROJECT NUMBER 6. CATEGORY CODE 5. PROGRAM ELEMENT 250 510 10 40478

9. COST ESTIMATES				
1TEM	U/M	QUANTITY	UNIT	COST (\$000)
PRIMARY FACILITY Energy Plant Mod b-615	BD	1	204,523	205 (205)
SUPPORTING FACILITIES Design Cost	LS			12 (12)
ESTIMATED CONTRACT COST CONTINGENCY PERCENT (10.0%) SUBTOTAL SUPERVISION, INSPECTION & OVERHEAD (6.00%) CATEGORY E EQUIPMENT TOTAL REQUEST TOTAL REQUEST (ROUNDED) INSTALLED EQUIPMENT-OTHER APPROPRIATIONS				217 22 239 14 (0) 253 250 (0)

10. DESCRIPTION OF PROPOSED CONSTRUCTION

The project includes modifications to the boiler controls and boiler stack accessories. Replace the existing induced draft and forced draft fan inlet vanes with variable frequency drives. Install economizers in the flue stacks to recover waste heat, install a boiler management system to reduce man-hours required to operate the boiler and upgrade the building combustion controls. The heat recovered by the stack economizer is used to preheat boiler feed water.

11. REQUIREMENT:

PROJECT:

Install four new variable frequency motor drives. Install two stack economizers with associated piping and valves. Install a boiler management system. Install new oxygen trim controls.

REQUIREMENT:

This project is required to reduce the gas consumption caused by low boiler efficiencies.

DD FORM 1391

PREVIOUS EDITIONS MAY BE USED INTERNALLY UNTIL EXHAUSTED.

PAGE NO.

FOR OFFICIAL USE ONLY

I. COMPONENT

ARMY

FY 19_95 MILITARY CONSTRUCTION PROJECT DATA

2. DATE 19 APR

19 APR 1992 14 APR 1992

1 INSTALLATION AND LOCATION

Fort Riley

Kansas

4 PROJECT TITLE

ECIP

Boiler Controls

S. PROJECT NUMBER

40478

CURRENT SITUTATION:

The existing 34,000 lbs/hr boilers utilize induced draft and forced draft fans with inlet vane control. The user has indicated they have trouble maintaining control of the furnace pressure. The boilers have no waste heat recovery systems at this time. By installing a stack economizer less gas input is required to make steam. The boilers are operated manually which requires an operator to be close by 24 hours a day. The current oxygen trim system is in poor condition and cannot control excess air to the boilers resulting in a lower boiler system efficiency.

IMPACT IF NOT PROVIDED:

Failure to approve this project will continue the excess energy being used to generate steam that is used for hospital systems, HVAC systems, and domestic hot water generation.

ADDITIONAL:

This project complies with the scope and design of CEHSU-FU-M, Energy Conservation Investment Program (ECIP) Guidance, that was in effect June 1991. The project has a Discounted Savings Ratio (SIR) of 4.05 and a simple payback of 4.0 years. The implementation of this project will provide an annual energy savings of 5,845 MBTU and an annual dollar savings of \$56,797.

Project validation will be through metering of electric and gas consumption at the Energy Plant along with boiler operating logs and engineering calculations will be used to verify the effectiveness of the project.

ESTIMATED CONSTRUCTION START: APR 1995 INDEX: 1992 ESTIMATED MIDPOINT OF CONSTRUCTION: OCT 1995 INDEX: 2029 ESTIMATED CONSTRUCTION COMPLETION: APR 1996 INDEX: 2055 FY 19_95 MILITARY CONSTRUCTION PROJECT DATA

ARMY

FY 19_95 MILITARY CONSTRUCTION PROJECT DATA

April 1992

LINSTALLATION AND LOCATION

Irwin Army Community Hospital
Fort Riley, Kansas

FROJECT NUMBER

Boiler Controls (ECIP)

EXISTING BOILERS

ENERGY PLANT FLOOR PLAN

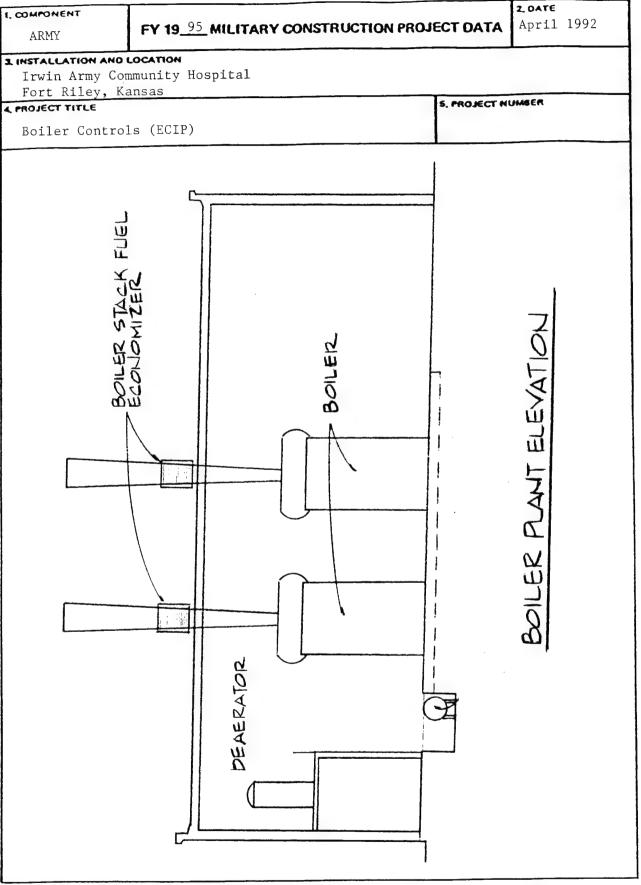


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PAGE NO.

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LIFE CYCLE COST ANALYSIS SUMMARY ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

PROJECT TIT	Fort Riley, Ks. TLE: Boiler C ORTION NAME: B	ontrols	FISCAL Y	PROJE (R.: 1995	ECT NO.: 40478
	TE: 4-15-92			PREPA	RED BY: RDF
B. SIOH C. DESIGN D. SALVAG	RUCTION COST	- 1B + 1C - 1D)	-	\$ 203130 \$ 12188 \$ 12188 \$ 0	\$ 227506
ANALYSIS	AVINGS (+) / COST DATE ANNUAL SAV COST \$/MBTU/YR(1)	INGS, UNIT COST SAVINGS	ANNUAL \$	AVINGS DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC B. DIST C. RESID D. NG E. COAL	\$ 11.13 \$ \$ 3.59	5738	\$ 1198 \$ 5 \$ 20599	15.04	\$ 18012 \$ \$ 389741
F. TOTAL		5846	\$ 21797		\$ 407753
A. ANNUAL (1) DISC	GY SAVINGS(+) / C . RECURRING (+/-) COUNT FACTOR (TA COUNTED SAVING/C	BLE A)	14.68	\$ 350 \$ 5138	
B. NONREC ITEM (1)(2)	CURRING SAVINGS SAVINGS(+) COST(-)(1) \$\$	(+) / COST (-) YEAR OF OCCURRANCE	DISCOUNT (2) FACTOR(3)	(+) CO \$	NTED SAVINGS ST (-) (4)
(3) (4) TOTA	\$	-		_	
C. TOTAL N	IONENERGY DISCO	OUNTED SAVINGS	(+)/COST (-) (3A	2+3BD4) \$	513800
(1) 25% a. iF b. IF c. IF	T NONENERGY QU MAX NONENERGY 3D1 IS = OR > 30 3D1 IS < 3C CALC 3D1b IS = > 1 GC 3D1b IS < 1 PROJ	CALC (2F5 X .33) CGO TO ITEM 4 C S1R = (2F5+3) TO ITEM 4	\$ 134558 D1) / 1E = 2.38		4
4. FIRST YEAI	R DOLLAR SAVING:	S 2F3+3A+(3B1d	/ YEARS ECONOM	IIC LIFE) \$	56797
	DISCOUNTED SAV				21553
6. DISCOUNT	ED SAVINGS RATIO	(IF < 1 PROJEC	CT DOES NOT QUA	LLIFY) (SIR) =	(5 / 1E) = 4.05
7 01401 5 04	VPACY DEDIOD (E	CTIMATED VEADO) CDD_45/4		4 01

INTRODUCTION

This project concerns implementing several modifications to the existing boilers and their operation. Four items are recommended. The first is the installation of variable frequency drives to replace the inlet vanes on the two existing induced draft fans at the top of the boiler stacks. The existing fan controls do not operate correctly and are not as efficient as other methods of air flow control. The second item suggested is the installation of a boiler management controller in the boiler plant for automatic start up and monitoring. While this system does not necessarily save much energy it does save non-energy dollars by eliminating one full-time boiler operator. The third item addressed is the installation of a boiler stack economizer in each boiler stack to preheat feed water using waste energy from the boiler stacks. This reduces the amount of gas input to the boiler required to heat the feed water. The fourth item included in this package is the replacement of the existing oxygen trim controls. The existing oxygen trim analyzing equipment has failed. This results in wasted energy and lower boiler system efficiency.

Manual calculations based on system profiles generated by TRACE and information from the user were performed to determined energy savings.

ASSUMED CONDITIONS

Gas Cost = 3.7 \$ / MCF
Electric Cost = 0.038 \$ / KWH
Maintenance Costs will not increase
One Boiler is Standby
0.746 KW / HP

ELECTRICAL ENERGY CAN BE SAVED BY NOTALLING VARIABLE FREQUENCY DRIVE CONTROL ON THE INDUCED DRAFT BOILER FANS. THE FAMS ARE NOW CONTROLLED BY INLET VANES. THE SYSTEM HEATING LOAD PROFILE IS USED TO DETERMINE THE PERCENT OF AIR YOLUME REQUIRER IT IS ASSUMED THAT COMBUSTION AIR PERCENTAGE FOLLOWS THE HEATING LOAD, THE PROFILE WAS GENERATED USING THE TRANE "TRACE" PROGRAM THERE IS ONE 15 HP INDUCED DRAFT FAN PER BOILER. SINCE ONE BOILER IS STANDBY THE LOST FOR INSTALLING VARIABLE FREQUENCY DRIVES ON BOTH BOILER FANS IS INCLUDED BUT THE SAVINGS FOR OHLY ONE 15 INCLUDED. THE DRIVES WILL BE CONTROLLED BY INTERNAL. BOILER PRESSURE SENSORS.

DIFFERENCE IN EHERGY USE INLET VANES x 38,482 VARIABLE SPEED MOTOR x 6,963	= 38,482 = <u>6,963</u> 31,519 KWH
ANNUAL ENERGY SAVING 31,519 KWH x 3413 BTU/KWH	= 107.6 ×106 BTU/4F
ANNUAL DOLLAR SAVING 31,519 KWH x 0.038 \$/KWH	= 1198 \$ MR

VARIABLE SPEED MOTOR CONTROL ILDUCED DRAFT FANS 1 @ 15 HP % DESIGN DESIGH POHER & FULL LOAD & HOURS & 0.746 = KWH FRACTION LOAD POWER HP KW/HP .05 15. .05 .746 .05 .05 15 608 ___746 .25 7A6 . . 6 80 ...

INLET VA	NE CONTR	01	:	
IMDUCED	DRAFT FANS	10 15 HP	· : :	
% DESIGN			HOURS × 0.746 KW/HP	= KMH
15.	.4c	15 15 15	90°L	= 16,169 = 3,129 = 4,037 = 4,037
25 34 35	.41 .42 .43	15 15 15	678 608 430	= 3,111 = 2,857 = 2,069
45 50 55	.40	15	317	= 1,632
66 65 76 75		· · · · · · · · · · · · · · · · · · ·		
£5				·
95 'CC ₁				
TETAL				38,482 KUH
				<u>-</u>
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SIMULATING SECONDARY SYSTEMS

Secondary system models mathematically relate the rate of heating and/or cooling energy delivery, e.g., hot and/or chilled water, to space sensible loads. Usually, such models are formulated to receive the space sensible loads as input, and allow calculation of heating and/or cooling rates at the coils. (Also see the discussion Overall Modeling Strategies later in this chapter.)

Fundamental Relations for Moist Air

The underlying principles for secondary system models are primarily those for mass and energy balances on moist air described in Chapter 6. For example, Equation (46) from Chapter 6 gives the relationship between space sensible heat gain, space moisture addition, supply airflow rate, and air enthalpy change from supply to exhaust conditions. Similarly, Equation (44) then relates input and output enthalpies and flow rates of mixing boxes, and Equation (40) the heating requirements at a coil to its inlet and outlet enthalpies. Equations (41) and (42) relate air mass flows, enthalpies, and moisture-removal rates for cooling-dehumidifying coils. [These particular equations must be augmented, however, with some type of model representing moisture removal and sensible cooling capability of the physical cooling coil, as discussed in Chapter 5, Equations (65) through (67).]

Since secondary systems are composed of mixing boxes, cooling coils, heating coils, and fans interconnected in various ways, mathematical models can be developed by assembling the applicable equations. For example, all mass and energy balance equations for a variable air volume terminal reheat system can be developed into an algorithm in which airflow rate, cooling coil energy rate, and reheating energy rate are calculated, given a particular required space sensible load on one or more service zones.

Models for Fans

A complete secondary system also requires a mathematical model for supply and return fans for two reasons: the required fan power must be calculated, since fan energy usage is an important factor and most, if not all, of the fan power is ultimately degraded to heat in the airstream, adding to cooling coil loads or reducing heating coil loads, depending on the fan location.

Computation of fan power is usually based on a characteristic curve, giving fraction of rated input power versus fraction of rated volume. This curve is determined principally by the method used to control air volume (see Figure 7). These curves can be determined experimentally or obtained from the manufacturer, although those shown in the figure often are accurate enough for energy analysis. Rated power can be calculated from rated volumetric flow rate, pressure rise, and efficiency as:

Fan horsepower =
$$\frac{Q\Delta p}{6370 \, \eta_F \, \eta_M}$$
 (45)

where

Q = air volumetric flow, cfm

 Δp = fan total pressure rise, in. of water

 η_F = fan efficiency

 $\eta_M = \text{motor efficiency}$

Most models assume that some fraction of the fan motor power goes directly into heating (i.e., enthalpy rise) of the air as it passes through the fan. The fraction is 1.0 if the fan motor is mounted in the airstream, and 1.0 minus motor efficiency η_m if mounted outside. The increase in air enthalpy occurs immediately downstream of the fan.

Modeling of System Controls

From a mathematical viewpoint, system control devices represent equations that must be satisfied at each point during the

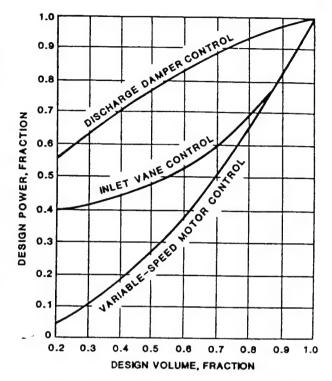


Fig. 7 Fan Power Versus Volume Characteristics

simulation and those that model other system components. For example, the room thermostat can be represented as a function relating heating and cooling delivery rate to space temperature, as shown in Figure 6. Similarly, cooling coil reset controls can be modeled as a relationship between outside or zone temperature and coil discharge temperature. An accurate secondary system model must ensure that all controls are properly represented and that the governing equations are satisfied at each simulation time step. This usually creates a need for iteration or, alternately, for use of values from an earlier solution point.

The controls on space temperature affect the interaction between loads calculation and secondary system simulation (see Figure 5). A realistic model might require a dead band in space temperature (Figure 6), in which no heating or cooling is called for; within this range, the true space sensible load is zero, and the true space temperature must be adjusted accordingly. If the thermostat has proportional control between zero and full capacity (i.e., over a throttling range), the space temperature will rise in proportion to the load during cooling and fall similarly during heating. Capacity to heat or cool also varies with space temperature after the control device has reached its maximum because capacity is proportional to the difference between supply and space temperatures. Failure to properly model these phenomena results in overestimating required energy.

Integration of System Models

To demonstrate the approach to system modeling, the variable air volume (VAV) system serving three zones is shown in Figure 8. For simplicity, the following assumptions are made: (1) the space temperatures, sensible loads, and latent loads have been previously determined by the heat balance method; (2) the loads are within the capacities of the respective heating and/or cooling equipment; (3) the fan is a variable volume unit with the fraction of nominal power expressible by a second-order polynomial in fraction of nominal volume; (4) the cooling coil discharge temperature is scheduled linearly with the temperature of the warmest zone; and (5) the outside air quantity is fixed.

SYSTEM TOTALS LOAD PROFILE - ALTERNATIVE 1 EXISTING SYSTEMS

SYSTEM LOAD PROFILE -----

System Totals

Percent	Cool	ling Loa	d	Heati	ng Load		Cooling	Airflo	w	Heating	Airflo	L) a====
Design	Cap.	Hours	Hours	Capacity			Cap.	Hours		Cap.	Hours	
Load	(Ton)	(%)		(Btuh)	(%)		(Cfm)	(%)		(Cfm)	(%)	
0 - 5	62.9	50	4,385	-890,475	43	3,599	17,334.2	0	0	0.0	0	0
5 - 10	125.8	0	0	-1,780,949	8	699	34,668.5	0	0	0.0	0	0
10 - 15	188.7	5	405	-2,671,424	11	902	52,002.7	0	0	0.0	0	0
15 - 20	251.6	9	757	-3,561,899	10	826	69,336.9	0	0	0.0	0	0
20 - 25	314.5	3	273	-4,452,373	8	678	86,671.2	0	0	0.0	0	0
25 - 30	377.4	4	382	-5,342,848	7	608	104,005.4	0	0	0.0	0	0
30 - 35	440.3	6	537	-6,233,322	5	430	121,339.6	0	0	0.0	0	•
35 - 40	503.2	5	417	-7,123,798	4	298	138,673.9	0	0	0.0	0	0
40 - 45	566.1	4	349	-8,014,272	4	317	156,008.1	0	0	0.0	0	0
45 - 50	629.0	4	323	-8,904,748	0	0	173,342.3	0	0	0.0	0	0
50 - 55	691.9	2	196	-9,795,222	0	0	190,676.6	0	0	0.0	•	0
55 - 60	754.8	3	264	-10,685,697	0	0	208,010.8	0	0	0.0	0	0
60 - 65	817.7	2	171	-11,576,172	0	0	225,345.0	0	0	0.0	0	0
65 - 70	880.6	1	109	-12,466,646	0	0	242,679.3	0	0	0.0	0	0
70 - 75	943.5	2	172	-13,357,121	0	0	260,013.5	57	4,985	0.0	0	0
75 - 80	1,006.4	0	20	-14,247,597	O	0	277,347.7	22	1,939	0.0	0	0
80 - 85	1,069.3	0	0	-15,138,071	ō	0	294,682.0	9	784	0.0	0	0
85 - 90	1,132.2	0	0	-16,028,546	0	0	312,016.2	2	196	0.0	0	0
90 - 95	1,195.1	0	0	-16,919,022	0	0	329,350.4	2	216	0.0	0	0
95 - 100	1,258.0	0	0	-17,809,496	0	0	346,684.7	7	640	0.0	0	0
Hours Off	0.0	0	0	0	0	403	0.0	0	0	0.0	0	0 8,760
+											~	0,100

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IS HP YARIABLE	2	EA			315	0601			Sac	10,000	10,630		
FREQUENCY DRIVE						•							
CONTRACTOR OH	15%										1595		
" PROFIT	7.01										१०७४		
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BOILER MALIAGEMENT CONTROLLER

PER ZECOMMENDATIONS BY USA CERL INSTALL
A BOILER MANAGEMENT SYSTEM IN THE
ENERGY PLANT FOR AUTOMATIC BOILER CONTROL,
SWITCHOVER AND MONITORING, THE SYSTEM
WOULD BE INTERFACED WITH THE EXISTING EMOS
SYSTEM. BY INSTALLING A BOILER
MANAGEMENT SYSTEM ONE FULL TIME
OPERATOR WOULD BE ELIMINATED.
BASED ON COST FIGURES FROM THE USER
THE NON ENERGY ANNUAL RECURRING SAVINGS
15 \$30,000 PLUS BENEFITS.

IN ORDER TO INTERFACE WITH THE EXISTING EMCS SYSTEM WIRING AND POINT PROGRAMMING IS REQUIRED.

ANNUAL DOLLAR SAVINGS - HON ENERGY 30,000 + 5000 = \$35,000 /YR

COST ESTIMATE ANALYSIS	TE ANAL	YSIS			INVITAT	INVITATION/CONTRACTOR	STOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	360	
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LOCATION FORT RILEY, KANSAS						ОТНЕЯ		ESTIMATOR	WAB		CHECKED BY R. D. FRY	BY FRYMIRE	
	QUAN	QUANTITY			LABOR		EOI	EQUIPMENT	Ž	MATERIAL		HS	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH UNIT	TOTAL HR8	PRICE	COST	PRICE	T800	PRICE	COST	TOTAL	T'N'S	TOTAL
COMPUTERIZED BOILER	-	EA			3000	3000) (200 0	10,000	13,000		
MANAGEMENT SKIEM						•							
WIFING & PEOCEDAMMING	0	EA			8	4500			200	1800	6300		
POINT FUNCTIONS													
SUBTOTAL											19,300		
CONTRACTOR CH	9,51										2895		
" PROFIT	10%				ć						1930		
											24/25		
CONTINGENCY	5.5%										1327		
CONSTRUCTION C	150										25.452		
											6		
STOH	1.9										1527		
TOTAL THIS SHEET											26,979		
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DA FORM 5418-R, Apr 86

BOILER STACK ECONOMIZER

INSTALL A BOILER STACK ECOHOMIZER IN EACH OF THE TWO BOILER STACKS. THE STACK ECOHOMIZERS WILL BE USED TO PREHEAT THE BOILER FEEDWATER FROM 225°F TO 286°F DEPENDING ON THE LOAD. EACH BOILER HAS A CAPACITY OF 33,500 MBH.

FLUE GAS TEMPERATURES WERE TAKEN FROM BOILER LOG SHEETS PROVIDED BY THE ENERGY PLANT OPERATING PERSONNEL. SAVINGS ARE CALCULATED BASED ON THE FLUE GAS EXIT TEMPERATURES AND THE MINIMUM STACK TEMPERATURE OF 240 °F REQUIRED TO PREVENT CONDENSATION IN THE STACK.

BOILER BASELOAD OPERATION IS ADDED AS A CONSTANT LOAD TO THE HEATING SYSTEM BOILER LOAD. THE BASELOAD, CONSISTING OF DOMESTIC HOT WATER, STERILIZER AND KITCHEN EQUIPMENT IS ESTIMATED AT 7445 ID/HR

THE BOILER ANHVAL OPERATION AT PARTIAL LOAD IS REFLECTED BY THE "SYSTEM LOAD PROFILE TOTALS" OUTPUT REPORT FROM THE TRACE GOO RUNS OF THE EXISTING BUILDINGS SERVED BY THE ENERGY PLANT

THE PRIMARY BOILER AND IDENTICAL STANDBY BOILER ARE USED ALTERNATELY. THE SAVINGS ARE THEREFORE CALCULATED BASED ON THE OPERATION OF I BOILER BUT THE COST OF BOTH ECOHOMIZERS IS INCLUDED.

THE BOILER STACK ECOHOMIZER HAS AN AUTOMATIC SOOT BLOWER AND NO OTHER COMPONENTS REQUIRING SCHEDULED MAINTENANCE THEREFORE NO MAINTENANCE COST DIFFERENCE IS TAKEN INTO ACCOUNT.

		<u>.</u>				
HR	HEATING	BASELOAD	TOTAL	% OF	HEAT	SAVINGS
YR	LOAD	MBH	BOILER	BOILER	RECOVERY	BTU x 103
	МВН		LOND	CAPACITY	BTUH 103	
267	975	7445	8420	25	300	89100
148	1000	7445	8445	25	300	44,400
130	1025	7445	8470	25	300	39,000
213	1050	7445	8495	25	300	63,9∞
103	1075	7445	8520	25	300	30,900
108	1100	7445	8545	26	320	34,560
169	1125	7445	8570	26	320	54,080
71	1150	7445	8595	26	320	22,720
145	1175	7445	8620	26	320	46,400
146	1200	7445	8645	26	320	46,720
155	1225	7445	8670	26	320	49,600
62	1250	7445	8695	26	320	19,840
165	950	7445	8395	25	300	49,500
394	996	7445	8441	25	300	118,200
400	1041.6	7445	8486.6	25	300	180,000
456	1087.4	7445	85324	25	300	136,800
25	1133	7445	8578	26	320	8,000
267	2037.4	7445	9482.4	28	360	96,120
177	2083.2	7445	9528,4	28	360	63,720
217	2129	7445	9574	29	370	80,290
815	2713.2	7445	10158.2	30	375	305,625
676	3617.6	7445	11062.6	33	440	297,440
578	4522	7445	11967	36	460	265,880
858	5426.3	7445	12871.3	38	510	437,580
473	6350.7	7445	13775.7	41	550	260,150
221	7235.1	7445	14680.1	44	605	133,705
301	8139.5	7445	15584.5	47	660	198,660
93	9044	7445	16489	49	700	3228990
TOT	AL					13,660,110
			18			

ANNUAL ENERGY SAVINGS 3229 x 10° BTU = 1.03 x 10° BTU/MCF = 3132 MCF = 3229 x 10° BTU/4R

ANNUAL DOLLAR SAVING 5132 MCF x 3.7 b/MCF

= 11,588 \$/4R

SENT BY:

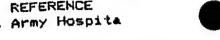
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4-22-91 :10:45AM : DIVISION FINTURE-

**** CHISTOMER saglia-Newstrom-Bredson PROPOSAL 322-10380-0-0

KENTURE 4150 B. ELWOOD TULSA. DKLAHOMA

04/19/91 PRINTED 16 HRS 48 MINS TIME CUST. REFERENCE Hamman Army Hospita



MODEL 511240

1.B

CYLINDRICAL FUEL ECONOMIZER

BOILER STACK ECONOMIZED OVERALL CONSTRUCTION

OVERALL PERFORMANCE

COUNTER CURRENT FLOW FLUID CIRCULATED IN TUBES IS WATER 1841181. BTU/UR HEAT EXCHANGED 5.646 BTU/HR-SOFT-F U EXTERNAL 143.5 DEG F LMTD

VERTICAL GAS FLOW DIMENSIONS DIM A (HEIGHT) 8'-3/4" DIM B (HUZ C-C) 5'-1 1/4" DIM C (DIAMETER)5'-0 1/2" DRAWING NO V- 6 SOUT BLOWERS ARE BUILT IN IH 4.0 HOZZLE SIZE SOF 2273. SURFACE AREA LB 604. LIQUID WEIGHT

PERFORMANCE SPECIFICATIONS TUBE SIDE GAS SIDE

LB/HR 304.0 550.0 27485. 23000. FLOW RATE DEG F 225.0 TEMP IN DEG F MF OUT PSIA 400.0 PSIG 14.7 , RES IN PRES DROP* (.8) 8.8 PSI .45 IN WATER

CONSTRUCTION SPECIFICATIONS TUBE SIDE

UNIT WEIGHT (DRY) 6577.

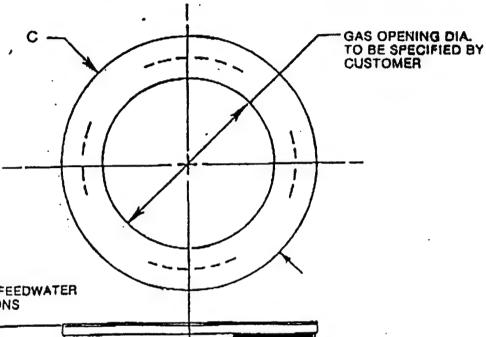
175. F81 DESIGN PRESSURE PSI 263. TEST PRESSURE DESIGN TEMPERATURE 700. DEC 2.000 IN TUBE OUTSIDE DIA C/SIL MATERIAL .060 THICKNESS FIN FIL 4.00 PITCH C/STL MATERIAL INSULATION MINERAL WO MATERIAL. 2.0 IN THICKNESS

PARTIAL LOAD EVALUATION

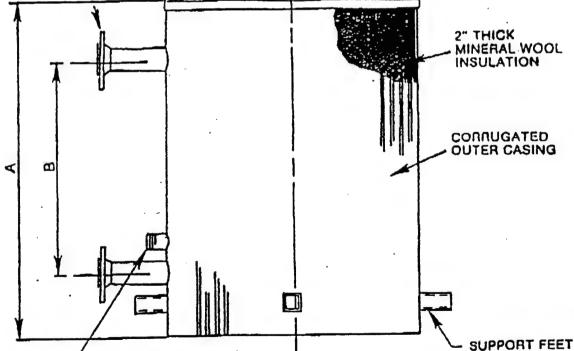
İ				ATURES		PRESS DR		TOTAL FLUID CINCH A		HEAT TRANSFER
	INDER	TU	BE	SH	ELL .OUTLET		.SHELL (W.G.)	TUBE		BTU/HR
65%	1.	225.0	286.4 276.0		266-8 244.0	3.7	.2	→ 15000. → 7300.	17925. 8724.	73031 37545

Kentube oylinorical Fuel economizer

BOILER STACK ECONOMIZER



RFWN FLG. FEEDWATER CONNECTIONS



2" NPT MALE CONN. FOR ROTARY SOOTBLOWER

GAS FLOW

SEE PERFORMANCE DATA SHEET FOR DIMENSIONS AND SIZE OF FEEDWATER CONN'S SYSTEM TOTALS LOAD PROFILE - ALTERNATIVE 1

SYSTEM LOAD PROFILE -----

HOSPITAL

System Totals

							1					
Percent	Cool	ing Los	d	Heati	ng Load		Cooling			Heating		
Design	Cap.	Hours	Hours	Capacity	Hours	Hours	Cap.	Hours	Nours	Cap.	Hours	Hours
-	(Ton)	(%)		(Stuh)	(%)		(Cfm)	(%)		(Cfm)	(%)	
Load	(1011)	(-/										
0 - 5	62.4	26	1,560	-904.391	43	3,599	17,345.3	0	0	0.0	0	0
•		0	0	-1.808.782	9	743	34,690.7	0	0	0.0	0	0
5 - 10	124.8	_	•	-2.713.174	10	815	52,036.0	٥	0	0.0	0	0
10 - 15	187.1	7	405					0	0	0.0	0	0
15 - 20	249.5	12	713	-3,617,565	8	676	69,381.3		•	0.0	0	0
20 - 25	311.9	6	347	-4,521,956	7	578	86,726.6	٥	0		_	
25 - 30	374.3	6	382	-5,426,347	10	858	104,072.0	0	0	0.0	0	0
		7	445	-6,330,738	6	473	121,417.3	0	0	0.0	0	0
30 - 35	436.7	•			3	221	138,762.6	٥	0	0.0	0	0
35 - 40	499.1	8	479	-7,235,130	_			0	0	0.0	0	0
40 - 45	561.4	6	333	-8,139,521	4	301	156,108.0	_	_	0.0	0	0
45 - 50	623.8	6	330	-9,043,913	1	93	173,453.3	0	0			_
50 - 55	686.2	4	225	-9,948,304	0	0	190,798.6	٥	0	0.0	0	0
55 - 60	748.6	4	244	-10.852.696	0	0	208,143.9	0	0	0.0	0	0
		3	151	-11,757,088	a	a	225,489.3	0	0	0.0	0	O
60 - 65	811.0	_		-12.661.477	0	0	242.834.6	٥	0	0.0	0	0
65 - 70	873.3	2	129		_		260,179.9	57	4.954	0.0	0	0
70 - 75	935.7	3	192	-13,565,869	0			22	1,970	0.0	0	0
75 - 80	998.1	0	0	-14,470,261	٥	٥	277,525.3				0	0
80 - 85	1.060.5	0	0	-15,374,653	0	0	294.870.6	9	792	0.0	_	
85 - 90	1.122.9	o	0	-16,279,044	٥	0	312,215.9	2	188	0.0	٥	0
90 - 95	1,185.2	0	0	-17,183,436	0	0	329,561.2	2	216	0.0	0	0
• • • • • • • • • • • • • • • • • • • •		ō	0	-18,087,826	0	0	346,906.6	7	640	0.0	0	0
95 - 100	1,247.6		_	0	0		0.0	0	0	0.0	0	8,760
Hours Off	0.0	0	2,825	0	-	103]					

SYSTEM TOTALS LOAD PROFILE - ALTERNATIVE 1 TING SYSTEMS

NURSE QUARTERS

System Totals

						. 1	Neetin			Cooling	Mirflow	****	Heating	Airflow	
P	re	en	t	Cool	-			-		Cap.	Nours		Cap.	Hours	Hours
1	205	ig	n	Cap.	Hours	Hours	Capacity		Hours		(%)		(Cfs)	(%)	
	L	0	4	(Ton)	(*)		(Stub)	(2)		(Cfm)	(*)		(00-)	•	
											_		0.0	•	۰
•	- 0		5	5.4	12	337	-45,749	47	1,882	1,926.4	0	0	0.0	0	0
,	5 -		10	10.7	8	245	-91,497	10	394	3,852.8	0	0		_	٥
1	o -		15	16.1	11	321	-137,246	15	600	5,779.2	0	0	0.0	0	•
_	5 -		20	21.5	9	262	-182,994	11	454	7,705.6	0	0	0.0	0	0
	, - o -		25	26.8	3	91	-228,743	7	292	9,632.0	0	0	0.0	0	0
_	_			32.2	9	276	-274,492	4	177	11,558.4	0	o	0.0	0	0
_	5 -		30			122	-320,240	5	217	13,484.8	0	٥	0.0	0	0
_	۰ ۰		35	37.6	4		-365,989	0		15,411.2	0	0	0.0	0	0
3	5 •	-	40	43.0	5	155				17,337.6	٥	0	0.0	0	0
4	۰ ٥	-	45	48.3	10	303	-411,738	0	-	19.264.0	0	0	0.0	0	0
4	5 .	-	50	53.7	2	60	-457,486	٥				0	0.0	0	0
5	0	-	55	59.1	5	154	-503,235	0	•	21,190.4		_	0.0	0	٥
•	5	_	60	64.4	5	154	-548,983	0	•	23,116.8	0	0		٥	0
		_	65	69.8	3	91	-594,732	0	•	25,043.1	0	0	0.0	_	_
	55	_	70	75.2	3	92	-640,481	a	0	26,969.5	0	٥	0.0	0	0
	70	_	75	80.5	4	124	-686,229	0	0	28,895.9	0	0	0.0	0	0
,			80	85.9	3	93	-731,978	0	0	30,822.3	0	0	0.0	0	0
(•			1	31	-777,726			32,748.7	0	0	0.0	o	0
•		-	85	91.3		0	-623,475			34,675.1	0	0	0.0	0	0
		-	90	96.6	0	_		,	_	36,601.5	0	. 0	0.0	0	0
•	90	-	95	102.0	0	0	-869,224			38,527.9	100		0.0	0	0
•	95	-	100	107.4	0	0	-914.972	•					0.0	0	8.760
	Hou	ırs	off	0.0	o	5.849	0		4,742	0.0			0.0	_	

SYSTEM TOTALS LOAD PROFILE - ALTERNATIVE 1 EXISTING SYSTEMS

BARRACKS

System Totals

							7					
Percent	Cool	ing Los	d	Heati	ng Load		Cooling	Mirflo	,	Heating	Mirflo	·
Design	Cap.	Hours	Hours	Capacity	Hours	Hours	Cap.	Hours	Hours	Cap.	Nours	Hours
Load	(Ton)	(*)		(Btuh)	(2)		(Cfm)	(2)		(Cfm)	(2)	
0 - 5	2.4	12	485	-24,995	16	267	1,498.9	0	0	0.0	0	٥
5 - 10	4.9	11	453	-49,989	9	148	2,997.7	0	0	0.0	0	0
10 - 15	7.3	15	621	-74,984	8	130	4,496.6	0	0	0.0	0	0
15 - 20	9.8	8	316	-99,979	12	213	5,995.5	0	o	0.0	0	0
20 - 25	12.2	9	361	-124,974	6	103	7,494.3	0	0	0.0	0	0
25 - 30	14.7	7	273	-149,968	6	108	8,993.2	0	•	0.0	0	0
30 - 35	17.1	5	203	-174,963	10	169	10,492.1	0	0	0.0	0	0
35 - 40	19.6	2	78	-199,958	4	71	11,990.9	0	0	0.0	0	o
40 - 45	22.0	6	246	-224,953	8	145	13,409.8	0	0	0.0	. 0	0
45 - 50	24.5	3	122	-249,947	9	146	14,988.7	0	0	. 0.0	0	0
50 - 55	26.9	5	183	-274,942	9	155	16,487.5	0	a	0.0	0	0
55 - 60	29.4	3	122	-299,937	4	62-	17,906.4	0	0	0.0	0	0
60 - 65	31.8	5	244	-324,931	0	0	19,485.3	0	0	0.0	0	0
65 - 70	34.3	2	62	-349,926	0	0	20,984.1	0	0	0.0	0	0
70 - 75	36.7	4	153	-374,921	0	0	22,463.0	0	0	0.0	۰	0
75 - 80	39.2	2	92	-399,916	0	0	23.961.9	0	0	0.0	0	0
90 - 85	41.6	1	31	-424,910	0	0	25,480.7	0	o	0.0	0	0
35 - 90	44.1	a	•	-449,905	0	0	26,979.6	0	0	0.0	0	0
70 - 95	46.5	0	0	-474,900	٥	0	28,478.5	0	0	0.0	0	0
95 - 100	49.0	0	0	-499.894	0	0	29,977.4	100	8,760	0.0	0	0
fours Off	0.0	0	4.695	٥	0	7,043	0.0	0	0	0.0	0	8.760
								-	-			J,
							I					

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE	TE ANAL	YSIS	cy is USA		TATION	INVITATION/CONTRACTOR	стоя	EFFECTIVE PRICING DATE MARCH 1992	RICING D	ATE	MARCH 18, 1992	1992	
PROJECT COMMUNITY HOSPITAL	ITAL -	ĖEAP			CODE (C)	CODE (Check one)	۲	DRAWING NO.	Ġ		SHEET	90	SHEETS
LOCATION FORT RILEY, KANSAS						ОТНЕЯ		ESTIMATOR	WAB		CHECKED BY R. D. FRY	FRYMIRE	
	AUA	QUANTITY		1	LABOR		EQ	EQUIPMENT	2	MATERIAL		ŝ	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH UNIT	TOTAL	UNIT	1800	PRICE	1800	PRICE	COST	TOTAL	TW	TOTAL
STACK ECONOMIZER	K	FA			5808	11,600			17271	27572	46/42		
RELIEF VALVE	7	EA				•			555		1110		
PIPING	15										300		
SUBTOTAL											40252		
12	NO	15%									1,538		
11	PROFIT	7.0/									5025		
											62815		
PONTING ENCY	5.5%										3465		
CONSTRUCTION	655		·								66270		
											,		
HOTS	6%										3976		
•													
TOTAL THIS SHEET											76,246		
DA FORM 5418-R, Apr 85													

INTRODUCTION

EVALUATE THE ECONOMIC PAYSACK OF THE THE THE TOTAL THE TOTAL THE TOTAL TO SOUTH OUT ON THE TOTAL THE TOTAL TOTAL THE

THE EMICING ECIDEDS ARE BARDOCK WILLOW MATER THE TYPE, BUILT IN 1968, EACH WITH A CAFACITY OF CH, not up/HR. COMEDETION CONTROL FOR THE TYPE BOULD IS POSITIONING TYPE. THESE POSITIONING SONTROLE PESSOND TO SYSTEM DEMANDS BY MITTING WHICH ADDIST THE AIR FLOK! PROPORTIONALLY TO THE FUEL FLOK!

THE PRIMARY BOILER AND IDENTICAL STATUST FOR ACE JAKE ANTERNATELY. THE SAVINGS ARE THEREFORE CALCULATED BASED OF THE ABSTRACT IN CONTROLS FOR BOTH BOILERS IS INCLUDED.

FLUE GAR TEMPERATURES AND FUEL CONSUMPTION WERE TAKEN FROM BOILER LOG SHEETS PROVIDED BY THE ENERGY PLANT OPERATING FEREONNEL.

	TOTAL		17. 4	= 5	- ,
MONTH	FUE:	AVG STICK	213	AV a. CTAIK	AV = 11.7%
	N MOF	7542 -=	Da		<u> </u>
72- 21	B193.3	453	3.0		
1711 21	74 97.1	461	8.0		
	12445.0	495	70.2	salama ayan an an an an an an an an an an an an a	
TIV. 70	43.5	4	<u>u</u>		
FEE. 90	10433.4	450	7.9		***************************************
MAR 45	10435.5	44.5	3.0	440	3.2
AFK 3	10121.4	421	5.0	441	8.5
MAY 35	9000.0			451	,,-3
JUNE 20	16170.	572	7,5		
ปีนเพ	17085.6	424	7,4		# · · · · · · · · · · · · · · · · · · ·
	15973.6	500	7.9		Continues of the state of the s
1		601	8,5	457	74,34

TOTAL = 1+7,716.2 MOF

TOTAL AMNUAL ENERGY CONSUMED IN FIGURE YEAR 1990 E = 147, 798.2 MOF Y 1, 521, 700 BTU/ MOF = 1.6088 X 10" STU

ANNHAL ENERGY CONSUMED IN 1990 BY BOILER 11: 1 EB = 147, 798.3 MCF x 300.5/ 365 x 1,031,000 MILL/ MCF = 1.0495 x 10" BTU

TOTAL ANNUAL ENERGY COST IN FISCAL MEAR 1995
3 = 147,795.3 MOF X # 3.05/MCF
470,954,56

AMNUAL ENERGY COST IN 1990 FOR BOILER NO. 1 90 = 147,795.5 MCF X 300.5/365 X # 3.45/MCF = # 359,577.66

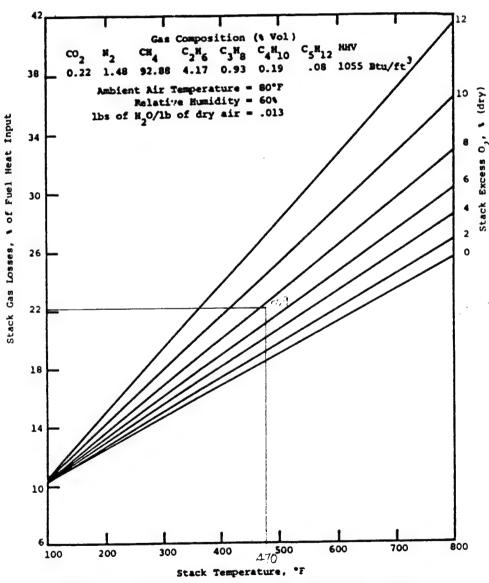


FIGURE 5-1. Stack gas losses (total of dry flue gas plus moisture in air plus moisture in flue gas due to the combustion of hydrogen in the fuel) as a function of stack temperature and excess O₂ for natural gas fuel.

KVB®

AT THE PUBLICOS IS FRIEN TO ANNUAL FUEL OFFICE PER CERT FULLE 1 1000

FROM FIGURE 511 STACK LOSCEC FO 11 100 C

- = 101, b=0.00 MOF x 0.00

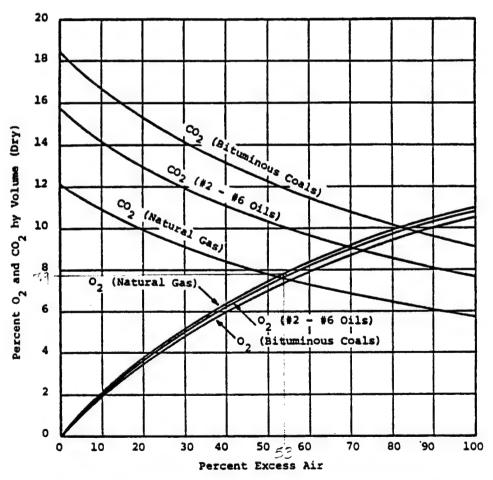


FIGURE 1-1. Relationship between boiler excess air and stack gas concentrations of excess oxygen (O₂) and carbon dioxide (CO₂) for typical fuel compositions.

FROM FOURTH ENGINEE FOREST NO DEFENSE TO NO.

EXCESS AIR REQUIREMENTS FOR NATURAL GAS
FIRED BOILERS RANGES FROM 5 TO 10 PERCENT.

A DECREASE IN EXCESS AIR WILL RESULT IN A
DECREASE IN EXCESS O2. MINIMUM EXCESS CO
WILL BE THAT AT WHICH THE BOILER JUST STARTS
TO SMOKE FOR THE PURPOSE OF THIS CALCULATION
ASSUME COMBUSTION IS CONTROLLED TO 20
PERCENT.

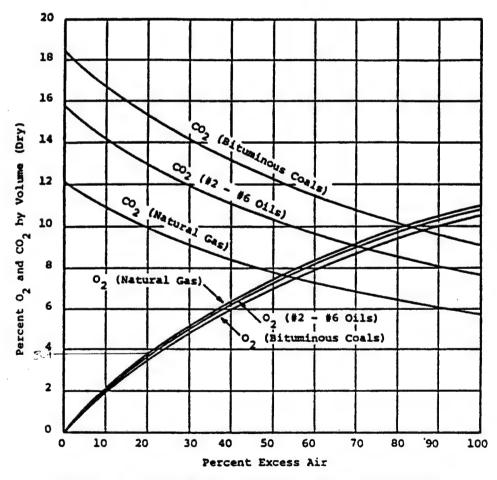


FIGURE 1-1. Relationship between boiler excess air and stack gas concentrations of excess oxygen (O₂) and carbon dioxide (CO₂) for typical fuel compositions.

FROM FIGURE 1-1. 20 PERCENT EXCRES AIR FOR NATURAL GAS YIELDS APPROXIMATELY 3.9 PERCENT EXCESS C2. ASSUME A STACK TEMPERATURE OF 470 °F

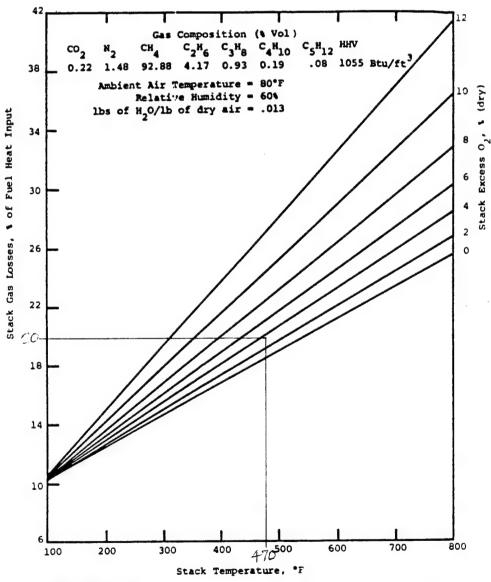


FIGURE 5-1. Stack gas losses (total of dry flue gas plus moisture in air plus moisture in flue gas due to the combustion of hydrogen in the fuel) as a function of stack temperature and excess O₂ for natural gas fuel.

KVB®

FROM FIGURE 5-1 THE STACK GAS LOSSES WITH REDUCED EXCESS OF 15 APPROXIMATELY 20 PERCENT. THEREFORE THE NEW ANNUAL FUEL LOSS EQUALS:

 $F_{B1} = 121, 680.52 \text{ MCF } \times 0.20$ = 24,336.1 MCF

TOTAL ANNUAL FUEL SAVINGS FOR BOILER NO 1 DUE TO OZ TRIM CONTROL:

 $F_T = F_B - F_B$ = 26, 769. 71 - 24, 336.1 = 2433.61 MCF

.. TOTAL ANNUAL ENERGY SAVINGS:

 $F_T = 2433.61 \text{ MCF} \times 1,031,000 \text{ BTU/MCF}$ = 2.509 × 109 BTU

.. TOTAL ANNUAL SAVINGS FOR BOILER NO 1:

 $Q_T = 2433.61 \text{ MCF} \times $^{\$}3.20/\text{MCF}$ = ${^{\$}}7787.55$

DUE TO LIMITED OPERATION OF BOILER NO. 2 IN FY 1990 CALCULATIONS WERE NOT COMPLETED.

					74717111	00104 8 TWOO/WOIT 4 TWO	0010	STAC CHICE PRICING DATE	CONTO	17.6	CATE POSES A SEC		
COST ESTIMATE ANALYSIS For use of this form, see TM 6-800-2; the proponent agency is USACE.	TE ANAL	YSIS nent egent	Y IS USA					January	y 1992		March	March 1992	
PROJECT Irwin Army Community Hospital	oital -	ÉEAP			CODE (Check one)	heck one)	ع	DRAWING NO.			SHEET -	9	SHEETS
LOCATION Fort Riley, Kansas					<u></u> [ОТНЕЯ		ESTIMATOR	ल		CHECKED BY R. D.	Frymire	v
	QUA	DUANTITY			LABOR		60	EQUIPMENT	W	MATERIAL		•	SHIPPING
TASK DESCRIPTION	NO. OF UNITS	L .	MH UNIT	TOTAL	UNIT	COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL
SHEET 20F2											20000		
· Sub total											20,000		
51R	0,4, 15%	15%									4,500		
	PROFIT 10 40	10 %									3000		
1 26 total											37,500		
SK SK	O.H.	15%									5625		
	PEOFIT	10%									3,750		
Sub total											46,875		
	6,5 %	80									2,578		
08F											49,453		
SIOH	6%										2967		
. TOTAL THIS SHEET											52510		
DA FORM S418-R. Apr 86													

COST ESTIMATE ANALYSIS	TE ANALY	SIS			INVITAT	INVITATION/CONTRACTOR	CTOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	1000	
. For use of this form, see TM 5-800-2; the proponent agency is USACE.	; the proper	ent egen	ey is USA					January 1992	1332		March 1992	1332	
Provect Irwin Army Community Hospital	•	EEAP			CODE (Check one)	<u> </u>	٥	DRAWING NO.			8HEET 2	000	SHEETS
LOCATION Fort Riley, Kansas					<u></u> ['	,	ESTIMATOR	菊		CHECKED BY R. D.	Frymire	
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DA FORM 5418-R, Apr 85													

SUMMARY OF ANNUAL SAVINGS FOR BOILER MODIFICATIONS

ENERGY SAVING ELECTRIC ID FANS

107,6 ×106 BTU/YR

GAS STACK ECONOMIZER ONIGEN TRIM

3229 ×10° 2509 × 10° 5738 × 10° BTD/41°C

NON-ENERGY ANNUAL RECURRING
BOILER MANAGEMENT 35,000 B

stallation: IRWIN ARMY COMMUNITY	
roject: ENERGY ENGINEERING ANALYSI	S PROGRAM (EEAP)
project number	program year
permanent:	category code
oint of contact:	
name <u>Maj</u> . James Fletcher	date28 August 1991
title <u>Chief of Logistics</u>	phone(913) 239-7207
	autovon
dfae Larry Stillwagon	date20 August 1991
	phone(913) 239-2371
	autovon
engineer district name Robert Miller	date28 August 1991
title Project Manager	phone(816) 426-2782
	autovon
other (A-E) nameRandall D. Frymire	date27 August 1991
	phone (816) 931-2200
	autovon
eviewed by:	
installation facility engineer name Larry Stillwagon	date28 August 1991
title Base Energy Officer	(2.0) 000 0071
uno	autovon
approved by:	
macom engineer	
name	date
title	phone
	autovon
	autovon

project development brochure, PDB-1

facility

IRWIN ARMY COMMUNITY HOSPITAL FT. RILEY, KANSAS

project coordinator for using service

LARRY STILLWAGON
BASE ENERGY OFFICER

OBJECTIVE

The objectives of this project are as follows:

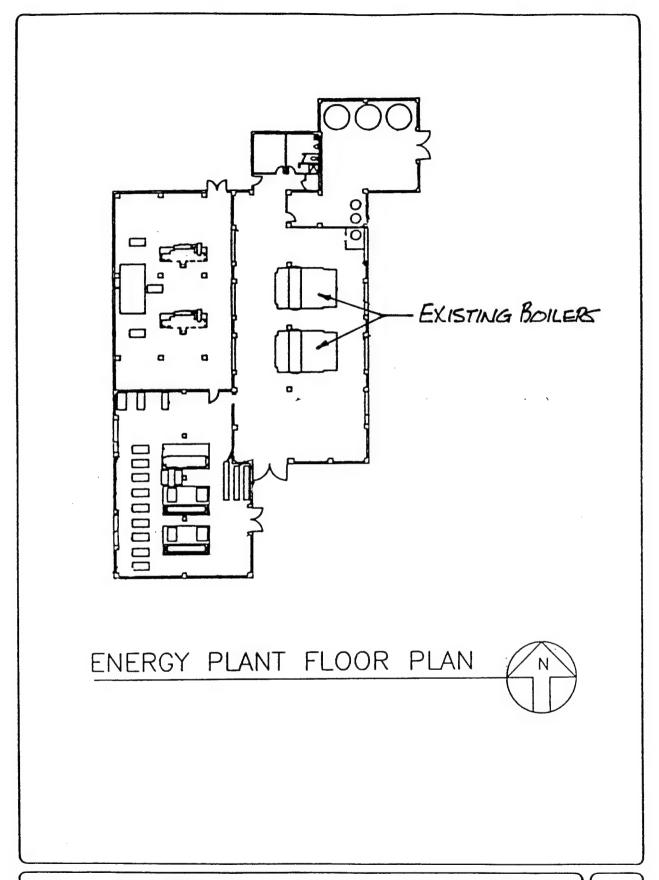
To install boiler stack fuel economizer on each boiler stack to preheat the feedwater to the boilers and reduce the fuel consumption required to heat the water within the boilers.

Upgrade the existing boiler combustion and management controls which will result in lower energy consumption and increased boiler efficiency.

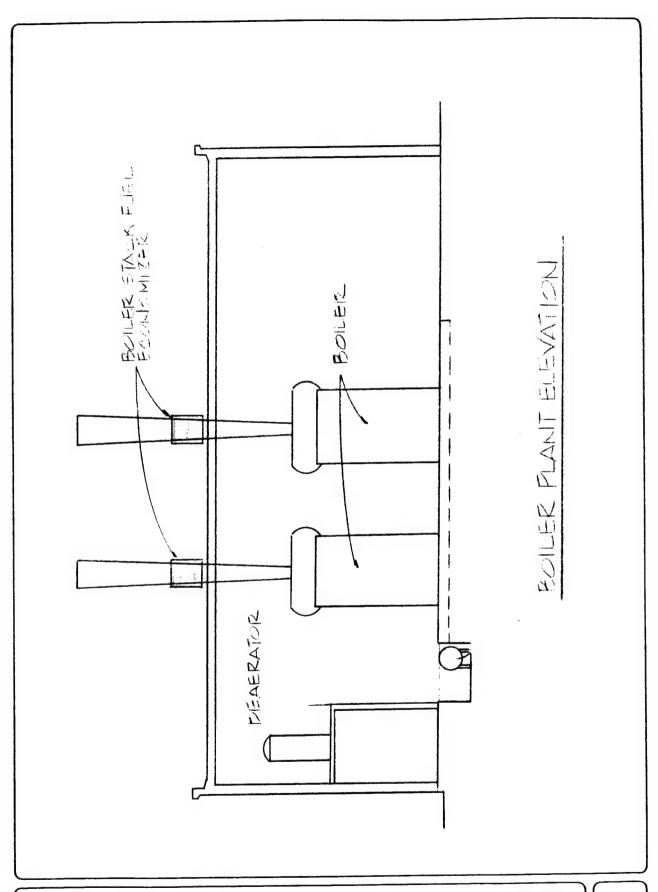
Install variable frequency drives on the boiler induced draft fans to save electrical energy and provide better air volume control.

functional requirements summary, PDB-1

DA FORM 5020-2-R, Feb 82



facilities requirements sketch, PDB- ½



functional requirements summary, PDB-1

DA FORM 5020-2-R, Feb 82

A. SPECIAL CONSIDERATIONS

	ITEM	Required Not Requ	To Be Determin	Comment Attached	Documen Attached
A-1	Cost estimates for each primary and supporting facility	- 2	ΕΔ	0 ∢	0 4
A-2	Telecommunications system coordination with USACC and authorization for exceptions	11-			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)	1			
A-4	Assignment of airspace	17			
A-5	Economic analysis of alternatives	1 =			
A-6	Approval for new starts				
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	113			
8-A	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	117			
A-9	Exceptions to established criteria	1			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)				
A-11	Identification of related or support projects (so projects can be coordinated)				
A-12	Required completion date	112	<u> </u>		

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 $\mbox{COMMENT ATTACHED} = \mbox{Significant information summarized or explained} \\ \mbox{and attached}.$

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E - Other (Check Comments Attached and

documentation checklist

DA FORM 5023-A-R, Feb 82

B. SITE DEVELOPMENT

В.	SITE DEVELOPMENT	Required or	aquired nined	ent sed	nent
	ITEM	Red U	To Be * Determined	Comment Attached	Document
B-1	Consultation with the District Office to determine and evaluate flood plain hazards				
8-2	Preparation, submission, and/or approval of new		-		
(A)	General Site Plan	. \(\frac{1}{2} \)	L	.	<u> </u>
B)	Annotated General Site Plan	11.15			
c) +	Sketch Site Plan				
0)	Facilities Requirements Sketch				
-3	Preparation of				
A) _	Site Survey				
B)	Subsoil information	NE			
-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan	NI			
7	Other Site Development Considerations (List and number items)	NIS			
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documentation checklist

DA FORM 5023-B-R, Feb 82

C. ARCHITECTURAL & STRUCTURAL

		50	_ E	5 P	E &
	ITEM	Required Not Requ	To Be Determin	Commen	Documen Attached
C-1	Reconciliation with troop housing programs and requirements	1/2			
C-2	Evaluation of existing facilities (including degree of utilization)	NR			
C-3	Approval for removal and relocation of existing useable facilities	NZ			
C-4	Evaluation of off-post community facilities	117			
C-5	Storage and maintenance facilities (including nuclear weapons)	115.			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	112			
C-7	Coordination of aviation facilities with FAA	SIL	L		
C-8	Coordination air traffic control and navigational aids with USACC	NE			
C-9	Tabulation of types and numbers of aircraft	N.Z			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	NR.			
C-11	Coordination chapels with Chief of Chaplains	115			
C-12	Review food service facilities by USATSA	NZ			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NZ			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NZ			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also I tern B-4)	NZ			
C-18	Analysis of deficiencies	NZ			
C-19	Consideration of alternatives	NE			<u> </u>
C-20	Determination whether occupants will Include physically handicapped or disabled persons	NZ			—
C-21	As-build drawings for alterations or additions	NR	·		
C-22	Availability of Standard Design or site adaptable designs	NE			ļ
	Other Architectural & Structural (List and number items)	NZ			

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- E Other (Check Comments Attached and explain)

documentation checklist

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

$\overline{}$	ITEM	Requir	To Be Determ	Comme	Docum
D-1	Fuel considerations and cost comparison analysis	115			
D-2	Energy requirements appraisal (ERA)	1:			
	Conformance with DOD Energy Reduction requirements	11-			
	Evaluation of existing and/or proposed utility systems				
D-3 D-4	Conformance with DOD Energy Reduction requirements Evaluation of existing and/or proposed utility systems Other Mechanical and Utility Systems (List and number items)				
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documentation checklist

DA FORM 5023-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

		5 0	Ē	6 6	P E
	ITEM	Required Not Requ	To Be Determin	Commen Attached	Documer Attached
E-1	Environmental impact assessment	NR NZ			
E-2	EIA conclusions require Environmental Impact Statement	1/2			
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)	MR			
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level	NE.			
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.	NE			
	Other environmental considerations (list and number items)				

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D - Designe

E - Other (Check Comments Attached and explain)

documentation checklist

A. SPECIAL CONSIDERATIONS

	A. SPECIAL CONSIDERATIONS	Required or Not Required	To Be * Determined	nent hed	nent hed
	ITEM	Requi	To Be Deter	Comment Attached	Document Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	MZ			
A-2	Construction phasing requirements	113	-	 	
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	112			
A-4	Equipment in place and justification	113			
A-5	Other equipment and furniture (O&MA, OPA) and costs	113	<u>-</u>		
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	214			
A-7	Type of construction (permanent, temporary, semi-permanent)	NZ			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	NR			
	Other special considerations (list and number items)	NZ	-		
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E - Other (Check Comments Attached and

B. SITE DEVELOPMENT

B. SITE DEVELOTMENT	red o	minec	nent hed	nent
ITEM	Required o	To Be Determined	Comment Attached	Document Attached
B-1 Construction restrictions or guidelines pertaining to				
(A) site access and preferred construction routes	175			
(B) Airfield clearance, explosive storage, working hours, safety, etc.	115			L
Facilities and/or functions or adjoining areas (structures, materials, impact)	IIR			
Real estate actions (acquisition, disposal, lease, right-of-way)	NT.			
B-3 Demolition/relocation required (data)				
Special considerations due to explosives/radioactivity/ chemical contamination/asbestos emissions/toxic gases	N			
(B) Restrictions on disposal of demolished/relocated material including hazardous waste	112			
Pavement types and requirements (including traffic surveys and MTMC coordination)	117			
B-5 Landscape considerations				
(A) Protection of existing vegetation	NZ			
(B) Stockpile topsoil	NR			
Other Site Development (List and number items)	NZ			

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- E Other (Check Comments Attached and explain)

C. ARCHITECTURAL & STRUCTURAL

C-1 Vibration-producing equipment requiring isolation C-2 Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential) C-3 Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological) C-4 Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing) C-5 Designation and strength of units to be accommodated C-6 Requirements and data for special design projects C-7 Unusual floor and roof loads (safes, equipment) C-8 Security features (arms rooms, vaults, interior secure areas)	Required Not Req	To Be Determi	
C-2 Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential) C-3 Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological) C-4 Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing) C-5 Designation and strength of units to be accommodated C-6 Requirements and data for special design projects C-7 Unusual floor and roof loads (safes, equipment) C-8 Security features (arms rooms, vaults, interior secure areas) Other Architectural & Structural (List and number items)	112		
C-3 Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological) C-4 Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing) C-5 Designation and strength of units to be accommodated Requirements and data for special design projects C-7 Unusual floor and roof loads (safes, equipment) C-8 Security features (arms rooms, vaults, interior secure areas) Other Architectural & Structural (List and number items)			
C-4 Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing) C-5 Designation and strength of units to be accommodated C-6 Requirements and data for special design projects C-7 Unusual floor and roof loads (safes, equipment) C-8 Security features (arms rooms, vaults, interior secure areas) Other Architectural & Structural (List and number items)			
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C-7 Unusual floor and roof loads (safes, equipment) C-8 Security features (arms rooms, vaults, interior secure areas) Other Architectural & Structural (List and number items)	10		
C-8 Security features (arms rooms, vaults, interior secure areas) Other Architectural & Structural (List and number items)	1-		
Other Architectural & Structural (List and number items)			
Other Architectural & Structural (List and number items)	15		
	113		

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E — Other (Check Comments Attached and explain)

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

	ITEM	Require Not Rea	To Be Determi	Commer Attached	Docume
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	R	C		
D-2	Special peak usage periods and peak leveling techniques	市	-		
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	NZ			
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	[5		
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	115	_		ļ
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	NZ			
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	NE			
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	K	7		
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	NE			
D-10	Solar energy evaluation	ME			
	Other Mechanical & Utility Systems (List and number items)	N			

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A - OFAE

B - Using Service

C - Construction Service

D - Designer

E — Other (Check Comments Attached and explain)

Required or Not Required E. ENVIRONMENTAL CONSIDERATIONS To Be * Determined Comment **ITEM** Waste water treatment, air quality, and solid waste disposal criteria Other Environmental Considerations (List and number items) NI

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- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

Required or Not Required F. FIRE PROTECTION To Be * Determined Document Attached Comment Attached **ITEM** NR F-1 Special fire protection systems or features (detection and suppression equipment, hazards, etc.) Other Fire Protection Considerations (List and number items) NZ

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COST ESTIMATE ANALYSIS	FE ANAL	YSIS			INVITAT	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	EO	
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DA FORM B418-R, Apr 86													

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CUST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	2; the propor	SIS sent agent	y is USA					January 1992	1992		March 1992	1992	
PROJECT Irwin Army Community Hospital	pital -	ÉEAP			CODE (Check one)	eck one)	۲	DRAWING NO.	j		SHEET	200	SHEETS
LOCATION Fort Riley, Kansas					<u></u>	ОТНЕЯ		ESTIMATOR	र्स		CHECKED BY R. D.	Frymire	6
	QUANTITY	П		1	LABOR		60	EQUIPMENT	Σ	MATERIAL		*	SHIPPING
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120 total											37,500		
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и и.,		10%									3,150		
-			•										
Sub total					: .						46875		
Contracences	5'5	%									2,578		
CONSTRUCTION COST											49,453		
SIOH	6%										2967		
. TOTAL THIS SHEET											52510		
DA FORM B418-R, Apr 86													

COST ESTIMATE ANALYSIS For use of this form, see TM 8-800-2; the preparent seems is USACE.	TE ANAL	YSIS	A to USA		INVITATI	INVITATION/CONTRACTOR		EFFECTIVE PRICING DATE January 1992	RICING DA	ATE	DATE PREPARED March 1992	1992	
PROJECT Irwin Army Community Hosp	Hspital -	EEAP			CODE (Check one)	-	٥	DAAWING NO.			SHEET 2	No	SHEETS
] []	,	ESTIMATOR	郊		CHECKED BY	-	e
	ΨΩΦ.	QUANTITY			LABOR		EOL	EQUIPMENT	ž	MATERIAL		ä	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	MH UNIT	TOTAL	UNIT	T802	UNIT	COST	PRICE	COST	TOTAL	WT	TOTAL
Firenish & Instruct													
0, TEN						•							
7													
System	2	57									30,000		
· .													
· .													
·-					,								
. TOTAL THIS SHEET											2000		
DA FORM 8418-R, Apr 86													

4. BOILER BURNERS/MODULAR BOILER

1. COMPONENT ARMY	FY 19 95 MILITARY CONSTRU	UCTION PROJECT DATA	2. DATE 19 APR 1992 14 APR 1992
3. INSTALLATION AN	D LOCATION	4. PROJECT TITLE	
Fort Riley		ECIP	
Kansas		Boiler Burners/Modu	lar Boiler

 5. PROGRAM ELEMENT
 6. CATEGORY CODE
 7. PROJECT NUMBER
 8. PROJECT COST (\$000)

 510 10
 40477
 580

310 10 40477			50,	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
PRIMARY FACILITY Bldg 610 ECIP Mod Bldg 620 Mod Bldg 621 Mod Trench & Backfill Regulating Stations Test & Balance High Turndown Boilers SUPPORTING FACILITIES	BD BD BD LF EA EA	1 1 1,200 2 17	75,606 59,236 46,584 3.48 2,080 210.00 274,272	(4) (4) (4)
Design Cost ESTIMATED CONTRACT COST CONTINGENCY PERCENT (10.0%) SUBTOTAL SUPERVISION, INSPECTION & OVERHEAD (6.00%) CATEGORY E EQUIPMENT TOTAL REQUEST TOTAL REQUEST (ROUNDED) INSTALLED EQUIPMENT—OTHER APPROPRIATIONS	LS			(29) 497 50 547 33 (0) 580 580 (0)

10. DESCRIPTION OF PROPOSED CONSTRUCTION

The project will include installing modular high-efficiency, gas-fired boilers for building heating and heating of domestic hot water in Buildings 610, 620 and 621 and high-efficiency, gas-fired burners in the energy center boilers with high-turndown ratio for capacity modulation. The project will include all required flues, piping, water heaters with circ. pumps, expansion tanks, electrical connections and demolition at each building.

11. REQUIREMENT:

PROJECT:

Install high-efficiency, gas-fired boilers and associated equipment in Buildings 610, 620, and 621, and high-efficiency, gas-fired burners in the boilers in the Irwin Army Community Hospital energy center at Fort Riley, Kansas.

DD FORM 1391

PREVIOUS EDITIONS MAY BE USED INTERNALLY UNTIL EXHAUSTED.

PAGE NO.

FOR OFFICIAL USE ONLY

I. COMPONENT

ARMY

FY 19 95 MILITARY CONSTRUCTION PROJECT DATA

2. DATE

19 APR 1992 14 APR 1992

1 INSTALLATION AND LOCATION

Fort Rilev

Kansas

4 PROJECT TITLE

ECTP

Boiler Burners/Modular Boiler

S. PROJECT NUMBER

40477

REOUIREMENT:

This project is required to reduce the gas consumption caused by low boiler efficiencies and piping and heat exchanger losses.

CURRENT SITUATION:

Presently Buildings 610, 620, and 621 are served with high pressure steam generated at the hospital boiler plant and piped to each building underground thru manholes and expansion loops. Steam pressure at each building is reduced and is utilized thru separate heat exchangers to heat building domestic hot water and building water for heating. The present hospital complex heating requirements are served by the two large boilers in the energy center and operate well below their rated capacity during this time.

IMPACT IF NOT PROVIDED:

Failure to approve this project will result in a continued greater consumption of gas needed to generate the steam required to heat the domestic hot water and building water for heating at each building and to handle the hospital complex heating requirements.

ADDITIONAL:

This project complies with the scope and design criteria of CEHSC-FU-M, Energy Conservation Investment Program (ECIP) Guidance, that were in effect June 1991. The project has a Discounted Savings Ratio (SIR) of 2.40 and a SPB of 5.0 years. The implementation of this project will provide an annual energy savings of 28,950 MBTU and an annual dollar savings of \$107,960.

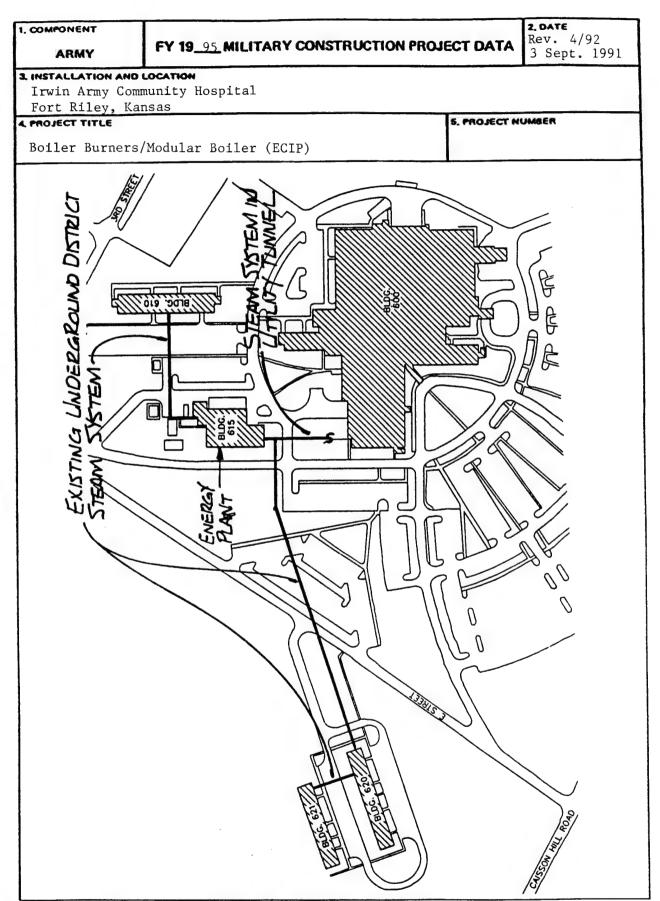
Project validation will be through the use of metering gas flow at the Energy Plant boilers and Buildings 610, 620, and 621. Comparison of total annual gas consumption along with engineering calculations for electric consumption will be utilized.

INDEX: 1992 APR 1995 ESTIMATED CONSTRUCTION START: INDEX: 2029 ESTIMATED MIDPOINT OF CONSTRUCTION: OCT 1995 INDEX: 2055 ESTIMATED CONSTRUCTION COMPLETION: APR 1996

DD FORM 1391c

PREVIOUS EDITIONS MAY BE USED INTERNALLY UNTIL EXHAUSTED

PAGE NO.



DD FORM 1391c

PREVIOUS EDITIONS MAY BE USED INTERNALLY UNTIL EXHAUSTED

PAGE NO.

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1. COMPONENT

ARMY

FY 19 95 MILITARY CONSTRUCTION PROJECT DATA

2.DATE Rev. 4/92 3 Sept. 1991

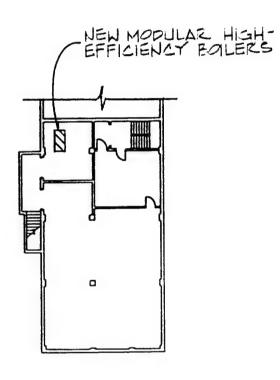
1 INSTALLATION AND LOCATION

Irwin Army Community Hospital Fort Riley, Kansas

4 PROJECT TITLE

Boiler Burners/Modular Boiler (ECIP)

S, PROJECT NUMBER



a

BUILDING 610 BASEMENT FLOOR PLAN



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1. COMPONENT

ARMY

FY 19 95 MILITARY CONSTRUCTION PROJECT DATA

2. DATE

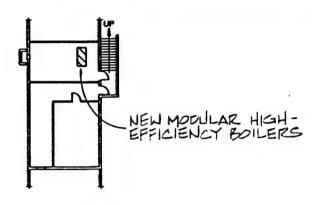
Rev. 4/92 3 Sept. 1991

Irwin Army Community Hospital Fort Riley, Kansas

4 PROJECT TITLE

Boiler Burners/Modular Boiler (ECIP)

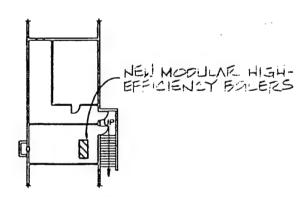
S, PROJECT NUMBER



BUILDING 620

BASEMENT FLOOR PLAN





BUILDING 621

BASEMENT FLOOR PLAN



DD FORM 1391c

PREVIOUS EDITIONS MAY BE USED INTERNALLY

PAGE NO.

AL USE

1. COMPONENT

ARMY

FY 19 95 MILITARY CONSTRUCTION PROJECT DATA

2.DATE Rev. 4/92 3 Sept. 1991

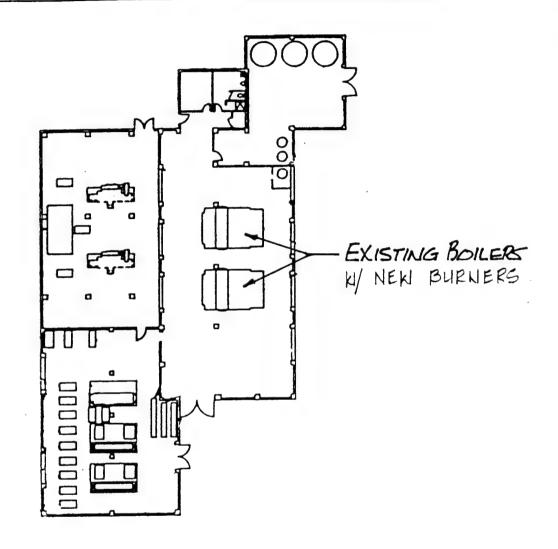
3. INSTALLATION AND LOCATION

Irwin Army Community Hospital Fort Riley, Kansas

4 PROJECT TITLE

Boiler Burners/Modular Boiler (ECIP)

S, PROJECT NUMBER



ENERGY PLANT FLOOR PLAN



DD FORM 1391c

PREVIOUS EDITIONS MAY BE USED INTERNALLY
UNTIL EXHAUSTED

PAGE NO.

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INTRODUCTION

The existing boiler plant consists of two Babcock Wilcox Boilers built in 1955. Each boiler is rated at 34,000 lbs/hr generating 125 psig steam. The boiler operation is alternated with one as primary and the second unit as standby. Based on boiler log information available for fiscal year 1990 the maximum demand for anyone boiler was in the range of 22,000 lbs/hr. Currently these boilers are providing district steam to Buildings 610, 620 and 621 for building domestic hot water and building heating. With the proposal to eliminate district steam to Buildings 610, 620 and 621, replace steam driven chillers and recover waste heat for preheating boiler feedwater and building reheat it is anticipated the maximum demand will decrease and the off-peak demand will decrease to a baseload. The baseload, consisting of domestic hot water for Building 600, sterilizers and kitchen equipment is estimated at 7445 lbs/hr. At this rate the existing boilers will operate less than five percent capacity for most of the year.

The TRACE 600 computer program was used to model the existing boilers with high-efficiency, high-turndown ratio burners derated to a maximum of 22,000 lbs/hr. Since the boiler effeciency is less at part load than at full load energy is saved by more closely matching the equipment size to the load. Electrical energy is saved due to the reduction of consumption by boiler auxiliaries.

The existing oversized boilers operating at part load conditions (new baseload approximately 7500 lbs/hr) were modeled in computer run T0115080 Alt. 1. The new 22,000 lbs/hr high-efficiency burners were modeled in computer run T0115080 Alt. 3.

The TRACE 600 program was used to model Building 610, 620 and 621 as they now operate in T0095080 existing buildings combined Alt. 1. The existing steam consumption is calculated based on steam supplied by the 34,000 lbs/hr central plant boilers with maximum boiler efficiency at full load of 78 percent. The individual building operation with new 90 percent efficient modular gas fired boilers is modeled in run T0095080 Alt. 2. The modular gas fired boilers in the individual buildings reduces gas consumption due to higher boiler efficiencies and elimination of piping and heat exchanger losses. Electrical energy is saved thru elimination of individual building condensate pump and reduced central plant boiler auxiliary. Manual calculations attached herein were performed to determine savings due to domestic hot water heater replacement.

ASSUMMED CONDITIONS

Heat exchanger efficiency = 80 percent.

District piping losses = 10 percent.

Existing boiler efficiency at full load = 78 percent.

Off-peak boiler efficiency at full load - 85 percent.

Gas cost = \$3.7/mcf

Electrical cost = \$0.038/kwh

Annual repair cost for existing 36 year old boilers will be reduced slightly due to new high-efficiency burners. Due to undefinable conditions this savings will not be included in LCC.

LIFE CYCLE COST ANALYSIS SUMMARY ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: Fort Riley, Ks. PROJECT TITLE: Boiler Burn				CT NO.: 40477
DISCRETE PORTION NAME:ANALYSIS DATE:4-15-92	Burners/Modular ECONOMIC LIFE		PREPA	RED BY:RDF
1. INVESTMENT A. CONSTRUCTION COST B. SIOH C. DESIGN COST D. SALVAGE VALUE E. TOTAL INVESTMENT (1A +		-	\$ 484573 \$ 29075 \$ 29075 \$ 0	\$ _542723_
2. ENERGY SAVINGS (+) / COST ANALYSIS DATE ANNUAL SAVI COST FUEL \$/MBTU/YR(1)	NGS, UNIT COST & I SAVINGS A	DISCOUNTED S NNUAL \$ AVINGS(3)	AVINGS DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC \$ 11.13 B. DIST \$ C. RESID \$ D. NG \$3.59 E. COAL \$	223 \$ 28727	103129	10.77	\$ 26756 \$ \$ 1239609
F. TOTAL	\$			\$ 1266365
3. NONENERGY SAVINGS(+) / CO A. ANNUAL RECURRING (+/-) (1) DISCOUNT FACTOR (TAI (2) DISCOUNTED SAVING/C	BLE A)	10.67	Y	786
B. NONRECURRING SAVINGS (ITEM SAVINGS(+) Replace-COST(-)(1) (1) ment \$ 20665 (2) " \$ 20665 (3) " \$ 20665 (4) TOTAL \$ 61995	(+) / COST (-) YEAR OF OCCURRANCE(2)	DISCOUNT FACTOR(3) 	(+) COS \$ 198 \$ 188	05 79
C. TOTAL NONENERGY DISCO	UNTED SAVINGS (+) / COST (-) (3A	2+3BD4) \$3	7565
D. PROJECT NONENERGY QUA (1) 25% MAX NONENERGY C a. IF 3D1 IS = OR > 3C b. IF 3D1 IS < 3C CALC c. IF 3D1b IS = > 1 GO d. IF 3D1b IS < 1 PROJE	CALC (2F5 X .33) GO TO ITEM 4 S1R = (2F5+3D1) TO ITEM 4			
4. FIRST YEAR DOLLAR SAVINGS	2F3+3A+(3B1d/Y	EARS ECONOM	IIC LIFE) \$1	07960
5. TOTAL NET DISCOUNTED SAVI	NGS (2F5+3C)		\$ 13	03931
6. DISCOUNTED SAVINGS RATIO	(IF < 1 PROJECT	DOES NOT QUA	LIFY) (SIR) =	(5 / 1E) = 2.40
7 SIMPLE PAYRACK PERIOD (ES	TIMATED VEARS) S	PR = 1F/4		5.03

STORAGE WATER HEATER - BLOG. 610

TM 5-810-5 RECOMENDS THE PER CAPITA METHOD WHEN THE NUMBER OF PEOPLE IS KNOWN AND IS MORE THAN 50 (TM 5-810-5 TABLE 4-4)

N = NUMBER OF PEOPLE = 157

G = CALLONS PER DAY = 30

B = DURATION OF AVERAGE HEATING TIME = 14

D = DURATION OF PEAK LOAD = 6

A = AVERAGE HOURLY CAPACITY

P = PEAK HOURLY REQUIREMENTS, GALLONS

 $A = \frac{GN}{PD}$ $A = \frac{30(151)}{14}$ A = 336

 $P = \frac{GN}{D}$ $P = \frac{30(151)}{G}$ $P = \frac{185}{G}$

75 = STOPAGE REQUIRED 785-336 = 599

599 GALLONS STORAGE 785 GPH RECOVERY@ 65° At (40°F-125°F)

785 × 85° At × 500 = 556042 BTU/HR

556042 × 6 HRS/DAY × 365 DAYS/YR = 1,217,731,980 BTUH/YR.

(1,217,731,980) -9 EFF. = 1312 MCF/YR

EXISTING WATER HEATER BUDG. GIO

782 GALLON STORAGE 579 GPH RECOVERY PEAK USAGE - GHRS/DAY

579 × 100° At × 500 = 482,500 BTJ/HR

482,500 × GHRYDAY × 365 DAYS/YR = 1,056,615,000 BTU/YR

BOILER EFF = .78

PIPING EFF = .90 .18(.9x.8) = 0.56 (EXISTING SYSTEM)

HEATER EFF = .80

 $\frac{(1.056,61500)}{.560EFF} = 1830 MCF/YR$

DIFFERENCE IN ENERGY PEQUIRED - BLDG. 610

EXISTING HEATER NEW HEATER

1.830 MCF/YR 1.312 MCF/YR 518 MCF/YR

STORAGE WATER HEATER - BLDG. 620

TM 5-810-5 RECOMENDS THE PER FIXTURE METHOD WHEN THE NUMBER OF PEOPLE IS KNOWN AND IS LESS THAN 50. (TM 5.810-5 TABLE 4.3)

FIXTURE NO GPH
SHOWER 16-150

16 - 150 = 2400

LAVATORY 16 × 3 = 48

KITCHEN SINK 16 × 20 = 240

LAUNDRY MACHINE 2 × 35 = 10

2.158 TOTAL GPH

PEAK LIGAGE - 4 HRS/DAY STORAGE CONVERSION FACTOR-0.185 RECOVERY CONVERSION FACTOR-0.25

2758 (0.185) = 680 STORAGE

2,158(0.25) = 690 RECOVERY

EYISTING WATER HEATER - BLDG GRO

365 GALLON STORAGE 300 GPH RECOVERY PEAK USAGE - 4 HRS/DAY

* THE TM 5-810-5 CRITERIA RESULTS IN A LARGER CAPACITY HEATER THAN IS CURRENTLY USED IN THIS BUILDING. THE EXISTING HEATER SATISFIES THE BUILDING LOAD. IT IS RECOMENCED THE EXISTING HEATER BE REPLACED BY ONE OF EQUAL CAPACITY.

EYHSTING ENERGY USAGE:

300 × 100° At × 500 = 250,000 BTU/HP

259,000 × 4 HPS/DAY × 365 DAYS/YR = 365,000,000 BTU/YR

BOILER EFF. = .78

PIPING EFF. = .90 .78(.9 x.8) = 0.56

HEATER EFF. = ,80

$$\frac{\left(\frac{365,000,000}{.56\,\text{EFF}}\right)}{1,031,000} = G32MCF/Y2$$

HEW ENERGY USAGE:

300 × 85° at × 500 = 212,500 BTU/HP

212,500 × 4 HRS/DAY × 365 DAYS/YR= 310,250,000 BTJ/YZ

$$\frac{\left(\frac{310,250,000}{.9 \text{ EFF}}\right)}{1,031,000} = 334 \text{ MCF/Y2}$$

DIFFERENCE IN ENERGY REQUIRED - BLDG. GRO

EXISTING G32 MCF/YR NEW 334 MCF/YR 298 MCF/YR

STORAGE WATER HEATER - BLDG. 621

TM 5-810-5 RECOMENDS THE PER FIXTURE METHOD WHEN THE NUMBER OF PEOPLE IS KNOWN AND IS LESS THAN 50. (TM 5-810-5 TABLE 4-3)

FIXTURE	HO. GAH
SHOWER	12 × 150 = 1800
LAVATORY	12 × 3 = 36
KITCHEN SINK	12 × 20 = 240
LAUNDRY MACHINE	2 × 35 = 10
•	2146 TOTAL GPH

PEAK USAGE - 4 HRS/DAY STORAGE CONVERSION FACTOR - 0.185 PECOVERY CONVERSION FACTOR - 0.250

2,146(0.185) = 529 STORAGE

2,146(0.25) = 531 PECOVERY

EXISTING WATER HEATER-BLOG. 621

310 GALLAN STORAGE 240 GAH RECONERY PEAK USAGE - 4 HRS/DAY

* THE TM 5.810-5 CRITERIA RESULTS IN A LARGER CAPACITY
HEATER THAN IS CURRENTLY USED IN THIS BUILDING. THE
EXISTING HEATER GATISFIES THE BUILDING LOAD. IT IS RECOMENDED
THE EXISTING HEATER BE REPLACED BY ONE OF EQUAL CAPACITY.

EXISTING ENERGY USAGE:

240 × 100° St ×500 = 200,000 BTU/HP

200,000 × 4 HRYDAY × 365 DAYS/YR = 292,000,000 BTU/YR

BOILER EFF. = .78

PIPING EFF. = .90 .78 (.9x.8) = 0.56

HEATER-EFF. = .00

 $\frac{(292,000,000)}{0.56}$ = 506 MCF/YR

NEW ENERGY USAGE:

240 × 85° At × 500 = 170,000 BTY HP

170,000 × 4-HRS/DAY ×365 DAYS/YR = 248,200,000 BTU/YR

(248,200,000) - 9 EFF. = 261 MCF/YR

DIFFERENCE IN ENERGY PEQUIRED - BLOG-GOL

EKISTING 506 MCF/YR NEW 267 MCF/YR 239 MCF/YR

SUMMARY OF ENERGY SAVINGS: (WATER HEATERS)

BLDG. G10 518 MCF/T2 BLDG. 600 298 MCF/T2 BLDG. 621 239 MCF/T2 1,055 MCF/TR

DIFFERENCE IN ENERGY REQUIRED FOR BLDG'S 610,620 4621

BASE RUN ANNUAL KWH 9, 339, 166

TOP 95080 ALT 2 KWH 9, 334, 257

4,909 KWH

BASE RUN ANNUAL MCF: 541, 037 THERM $\times \frac{0.1 \times 10^6}{1.031 \times 10^6} = 52,477$ $T \phi \phi 95080$ ALT 2 MCF: 515, 220 THERM $\times \frac{0.1 \times 10^6}{1.031 \times 10^6} = 49,973$ 2504

DUE TO PIPING LOSES & HEAT EXCHANGER EFF.

ANNUAL MCF = 2504 ÷ 0.8 × 1.1

= 3443 MCF

ANNUAL ENERGY SAVINGS $4909 \text{ KWH } \times 3413 \text{ BTU/KWH}$ = 16.754×10^6 $3443 \text{ MCF} \times 1.031 \times 10^6 \text{ BTU/MCF}$ = 3549.73×10^6 $1055 \text{ MCF} \times 1.031 \times 10^6 \text{ BTU/MCF}$ = 1087.71×10^6 4654.19×10^6

DIFFERENCE IN ENERGY REQUIRED FOR BOILER BURNERS

ТФ 1 1 5080 ALT. 1 КИН 8,509,402 ТФ 1 1 5080 ALT. 3 КИН 8,448,912 60,490 КИН TO | 15000 ALT. 1 THERMS 432, 554
TO | 15000 ALT. 3 THERMS 191,656
240,898 THERMS

MCF = 240, 898 THERMS × 1.031 x 10 BT4/THERM

= 23,365

ANNUAL ENFRGY SAYINGS
60, 490 KWH x 3413 BTW/KWH = 206.45 x 10 BTW
23, 365 MCF x 1.631 x 10 BTW/MCF = 24,089.3 x 10 BTW/YK
24, 295.8 x 10 BTW/YK

ANNHAL TOTAL ELECTRIC ENERGY SAVINGS $4909 \text{ KWH } \times 3413 \text{ BTU/ KWH}$ = 16.754×10^6 $60,490 \text{ KWH } \times 3413 \text{ BTU/ KWH}$ = 206.45×10^6 223.21×10^6

POLLAR SAYINGS 4909 KWH X # 0.038/KWH = # 186.54 60,490 KWH X # 0.038/KWH = # 2298.62# 2485.16

ANNUAL TOTAL NATURAL GAS ENERGY SAVINGS

3443 MCF \times 1.031 \times 10⁶ BTU/MCF = 3549.73 \times 10⁶

1055 MCF \times 1.051 \times 10⁶ BTU/MCF = 1087.71 \times 10⁶

23,365 MCF \times 1.031 \times 10⁶ BTU/MCF = 24,089.3 \times 10⁶

28,726.7 \times 10⁶

DOLLAR SAVINGS

3443 MCF X \$ 3.7/MCF

1055 MCF X \$ 3.7/MCF

23,365 MCF X \$ 3.7/MCF

= \$ 12,739.10 = \$ 3903.50 = \$ 86,450.50

ANNUAL RECURRING COSTS FOR MAINTENANCE ARE
BASED ON MAINTENANCE FREQUENCY DERIVED FROM
MEANS FACILITIES MAINTENANCE STANDARDS.

EXISTING SYSTEM FOR BUILDINGS 610, 620 & 621.

LUBRICATE COND. PUMPS - 6 @ 1.0 HR x \$ 38.00/HR = 228

CIRC. PUMPS - 3 @ 1.0 HR x \$ 38.00/HR = 114

HEAT EXCHGR \$ AUX. - 3 @ 1.0 HR x \$ 38.00/HR = 114

HOT KIR GENERATOR - 3 @ 1.0 HR x \$ 38.00/HR = 114

EXISTING SYSTEM MAINTENANCE COST = #570.00/Ye

HEW SYSTEM:

LUBRICATE CIRC PUMPS - 3 @ 1.0 HR × \$ 38.00/HR = 114

MAINTAIN BOILERS - 14 @ 4 HR × \$ 38.00/HR = _2126

HOT WIR GENERATOR - 3 @ 1.0 HR × \$ 38.00/HR = __114

\$ 2356/YE

ANNUAL FECURRING MAINTENANCE COST DIFFERENCE = # 570.00 - # 2356.00 = # - 1786.00 EQUIPMENT SERVICE LIFE: (ASHRAE HANDRECK 1987)

HOT WATER BOILERS = 25 YRS

HEAT EXCHANGERS = 24 YRS

BASE MTD PUMP = 20 YRS

PIPE MTD PUMP = 10 YRS

CONDENSATE PUMP = 15 YRS

MOTORS = 18 YRS

NONRECURRING EXPENSES FOR THE EXISTING SYSTEM WILL OCCUR THRU-DUT THE STUDY LIFE DUE TO THE EQUIPMENT AGE (32 YEARS) GREATER THEN EXPECTED SERVICE LIFE. FOR THIS PROJECT THE EXISTING SYSTEM REPLACEMENT COST EST. AT \$61,995 WILL BE DIVIDED EQUALLY OVER THE FIRST THREE YEARS OF THE STUDY LIFE.

: YEAR 1 = \$61,995/3 = \$20,665
YEAR 3 = \$20,665

TOTAL ANNUAL RECURRING MAINTENANCE COST =

TOTAL NONRECURRING SAVINGS WILL OCCUR IN .

THE FIRST THREE YEARS OF THE STUDY AS FOLLOWS: YEAR 1 = \$20,665

YEAR 2 = \$20,665

YEAR 3 = \$20,665

COST ESTIMATE ANALYSIS	E ANAL	YSIS			INVITAT	INVITATION/CONTRACTOR	стоя	EFFECTIVE PRICING DATE	RICING DA	,TE		3E D	
For use of this form, see TM 5-800-2; the proponent agency is USACE.	the propo	nent egen	cy le USA	ĜĒ.				Janua	January 1992		April 19	1992	
PROJECT ITWIN Army Community Hosp	Hospital .	EEAP			CODE (Check one)	reck one)	۲	OFF PEAK/	MOD.	BOILER	SHEET	0 %	SHEETS
LOCATION Fort Rilev. Kansas						ОТНЕЯ		ESTIMATOR K	R KIA13		CHECKEDBY	7	
	AUA	QUANTITY			LABOR		EQ	EQUIPMENT	AM	MATERIAL		1H8	SHIPPING
TASK DESCRIPTION	NO. OF UNITS	UNIT	MH	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	101AL	TW	TOTAL
SHRET COPG											171,400		
SHEET 3 OF 6						٠					41,969		
SHEET 4 OF 6											21,115		
SHEET 5 OF 6											31,114		
SHEET 6 OF 6											15,761		
SUBTOTAL											293,959		
SUBCONTRACTOR OH @	1590										44,094		
SUBCONTRACTOR PROFIT	@ 10%										29,396		
SUBTOTAL											267,419		
GEN. CONTRACTOR OF	<i>છ</i>)	15%									55,117		
GEN. CONTRACTOR F	FROFIT	8)	1000								36,745		
SUBTOTAL											459,311		
CONTINGENCIES @	5.590										0.5.39		
CONSTRUCTION COST	BA	o E D	NA	1992	. 1	MBANS CL	w5T5				484,512		
SIOH @ 690											29,074		
TOTAL THIS SHEET											が	1	
DA FORM S418-R. Apr 86													

COST ESTIMATE ANALYSIS For use of this form, see TM 6-800-2; the proponent agency is USACE.	E ANALY	(SIS	y is USAC		INVITATI	INVITATION/CONTRACTOR		EFFECTIVE PRICING DATE January 1992	RICING DA		DATE PREPARED April 1992	16D	
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)		٥	OFF PEAK/ MOD. BOILER	/ MOD.	_	SHEET 2	000	SHEETS
LocATion Fort Riley, Kansas] [отнев		ESTIMATOR	MAK		CHECKED BY R. D.	Frymire	g)
	QUAN	QUANTITY		_	LABOR		EQL	EQUIPMENT	W	MATERIAL		SH	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH UNIT	TOTAL HRS	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TW TW	TOTAL
ENERGY PLANT													
GENERAL DEMOLITION		2									0005		
PACKAGE 22,000 MBH													
Burners	2	EA			13,000	26,000	0001	0000	57457	114,900	142,900		
GAS TRAIN INSTALLATION	_	2		1						į	10,000		
BOILER MODIFICATIONS	-	7.5	1								3500		
START-UR/CHECK-OUT		7.5					ļ		I		10,000		
	·												
TOTAL THIS SHEET											171,400		
DA FORM 6418-R. Apr 26													

COST ESTIMATE ANALYSIS For use of this form, see TM 8-800-2; the proponent agency is USACE	FE ANAL	YSIS	cy is USA	Ä	INVITATI	INVITATION/CONTRACTOR	CTOR	EFFECTIVE PRICING DATE January 1992	STIVE PRICING DA January 1992	ATE 2	DATE PREPARED April 1992	1ED	
PROJECT Irwin Army Community Hospital		EEAP			CODE (Check one)	eck one)	Ö	DRAWING NO.	c/Mob.	BOILER	SHEET 3	0 40	2 SHEETS
LOCATION Fort Riley, Kansas						отнея		ESTIMATOR	日本の		CHECKED BY R. D.	Fromfre	d
	QUA	QUANTITY		_	LABOR		EQ	EQUIPMENT	, W	MATERIAL		ŝ	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH UNIT	TOTAL HR8	UNIT	COST	UNIT	TSOO	PRICE	COST	TOTAL	TIND	TOTAL
GAS FIRED EXPLERS													
BLDG. 610						•							
HEAT	4	EA			0301	4200			2005	11220	15420		
BA. I	7	怂			805	1730			2245	4490	0220		
BLP9 620													
HEAT	80	EA			280	2340			(730	5190	7530		
COM. HW	-	日本			820	820			1949	1949	6012		
B.CB. 601													
HEAT	W	49			180	2340			1730	5190	7530		
DOM. HW	-	EA			100	180			1720	1720	2500		
TOTAL THIS SHEET											4198		
DA COBLESSED AND BE													

COST ESTIMATE ANALYSIS	E ANAL	YSIS		,	INVITATI	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	4ED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.	the propo	nent agen	cy le USA	j.				January 1992	ry 1992		April 1992	1992	
PROJECT Irwin Army Community Hospital	1	- EEAP			CODE (Check one)	eck one)	۲	DRAWING NO.	JMOD.	/MOD. BOILER	SHEET 4	9	SHEETS
LOCATION Fort Riley, Kansas					[_	ОТНЕЯ		ESTIMATOR	200		CHECKED BY	Fromfro	
	QUAI	QUANTITY			LABOR		EOL	EQUIPMENT	W	MATERIAL		8	SHIPPING
TASK DESCRIPTION	NO. OF	WEAS	MH UNIT	TOTAL	PRICE	COST	PRICE	COST	PRICE	1800	TOTAL	TIND	TOTAL
BLR RUE & FMTINGS													
	150	1			9.50	1425		-	15.50	5202	3450		
BLC4, 020 (4")	001	ቷ	-		9.50	950			15.50	1350	0022		
Patca. 621 (+1)	00	n n			9.50	950			13.50	1350	2300		
MIS. PIPING WINSUL													
PL DG 610		7				1716				640	0382		
BLDG GLD	_	15			l	1140				430	1510		
BLCG 621	_	75				1140				430	1570		
MOD. BOILER CONTROLS	10	EA					1		4525	13515	13575		
TOTAL THIS SHEET											21115		
DA FORM 6418-R, Apr 86													

COST ESTIMATE ANALYSIS	TE ANAL	YSIS			INVITAT	INVITATION/CONTRACTOR	STOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	160	
For use of this form, see TM 5-800-2; the proponent sgency is USACE.	t; the propo	nent sen	cy is USA	CE.				Janus	January 1992	2	April 1992	1992	
PROJECT Irwin Army Community Hospital		EEAP			CODE (Check one)	eck one)	٥	DRAWING NO.	MOP.	BOILER	SHEET 5	9	SHEETS
LOCATION Fort Riley, Kansas					[ОТНЕЯ		ESTIMATOR	五		CHECKED BY	Frvmire	4
	AUA	QUANTITY			LABOR		EOL	EQUIPMENT	ž	MATERIAL	1	48	SHIPPING
TASK DESCRIPTION	NO. OF UNITS	UNIT	TINO	TOTAL HR8	UNIT	COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL
WATER HTR W/ PUMP				, v									
BLDG 610 (780m)	-	EA			213	213.	1		9476	94769476	9689		
Expa (200 (200 cm)	_	EA			138	138		1	6180	0860	7118		
PUDG (26/ (300 602)	_	EA			(05	105	1		2005	5002	5107		
GAS PIPING WFITTINGS	v												
(i) 010 bala	400	u.			3.25	1300			w.	1400	2780		
BLD4 620 (x)	9001	ر ۾			3.5	3500			12.4	4210	0111		
BLOG (621 (#)	300	T T			3.25	975			3.7	1110	5802		
EXPANSION TANKS	Ŋ	EA	1		35	105	l		1040	3120	3228		
TOTAL THIS SHEET											37714		
DA FORM SA18-R. Apr 85													

COST ESTIMATE ANALYSIS	FE ANAL	Vele			INVITATI	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE	RICING D	\TE	DATE PREPARED	1ED	
use of this for	the propor	nent agent	EY IN USA	JE.			٠.	Janua	ry 1992		April	1992	
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)	eck one)	۲	DRAWING NO	1 .00M	MOO. BOILER	SHEET 6	0 5	2 SHEETS
iley,						ОТНЕЯ		ESTIMATOR	五		CHECKED BY	Fromfre	
	QUAN	QUANTITY			LABOR		EOL	EQUIPMENT	W	MATERIAL		18	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH UNIT	TOTAL HR8	PRICE	COST	UNIT	COST	PRICE	COST	TOTAL	TW	TOTAL
BLDG 610, 6204621	W	EA			1000	3000					3000		
DEMO. OF EQUIP. RM.						٠							
MIS. ELECT.	W	EA			350	1050			051	450	1500		
											•		
CIRC. PLIMPS													
4610	_	KA A			26	92	ļ		0201	1070	1162		
4 620		EA			26	92			999	698	452		
129#	_	EA		1	45	92			2002	003	452		
NEW GASLINE													
2KFILL	1200	77 77			2.0	2400	275	900			3300		
REGULATING STATIONS	es	EA		İ	300	909			9991	0002	2600		
NEW HLI BOILERS						-							
TEST & BALANCE	Ē	EA			135	2295					2295		
TOTAL THIS SHEET											15761		
DA FORM SA18-R, Apr 86													

A FORM SAIS-R, Apr 86

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V 600 PAGE 1

ONTHLY ENERGY CONSUMPTION - ALTERNATIVE 1 XISTING EQUIPMENT COMBINED COMPLEX

------ MONTHLY ENERGY CONSUMPTION -----

	ELEC	DEMAND		
	On Peak	On Peak	GAS	WATER
Month	(kWh)	(kW)	(Therm)	(1000 GL)
Jan	520,560	1,023	122,964	129
Feb	469,624	1,022	98,947	117
March	574,069	1,290	66,786	169
April	619,115	1,350	43,629	384
May	907,854	2,166	1,030	1,172
June	1,066,403	2,507	3,416	1,730
July	1,249,361	2,693	7,595	2,269
Aug	1,208,242	2,655	6,638	2,115
Sept	946,409	2,401	364	1,340
Oct	679,523	1,407	35,425	499
Nov	551,683	1,281	70,091	158
Dec	546,322	1,266	84,152	149
Total	9,339,166	2,693	541,037	10,230

Building Energy Consumption = 235,380 (Btu/Sq Ft/Year)

Source Energy Consumption = 417,725 (Btu/Sq Ft/Year)

365,275 (Sq Ft) Floor Area =

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 2 MODULAR BOILERS FOR 610,620,621 COMBINED

	ELEC	DEMAND		
	On Peak	On Peak	GAS	WATER
Month	(kWh)	(kW)	(Therm)	(1000 GL)
Jan	522,594	1,025	119,727	129
Feb	471,462	1,025	97,020	117
March	575,556	1,291	65,908	169
April	620,218	1,350	43,042	384
May	907,854	2,166	1,030	1,172
June	1,063,416	2,435	403	1,719
July	1,243,055	2,621	650	2,249
Aug	1,201,801	2,583	498	2,095
Sept	946,409	2,401	364	1,340
Oct	680,517	1,407	35,014	499
Nov	553,264	1,281	68,959	158
Dec	548,110	1,266	82,602	149
Total	9,334,257	2,621	515,220	10,179

Building Energy Consumption =
Source Energy Consumption =

228,266 (Btu/Sq Ft/Year)

410,148 (Btu/Sq Ft/Year)

Floor Area = 365,275 (Sq Ft)

STING EQUIPMENT

	ELEC	DEMAND	GAS		GAS DMND
	On Peak	On Peak	On Peak	WATER	On Peak
Month	(kWh)	(kW)	(Therm)	(1000 GL)	(Thrm/hr)
Jan	520,634	1,126	105,191	190	168
Feb	483,769	1,126	83,136	162	154
March	552,402	1,187	54,577	207	108
April	577,471	1,252	34,589	347	86
May	813,195	1,870	1,079	1,031	28
June	927,743	2,106	0	1,466	0
July	1,075,281	2,273	1,022	1,895	51
Aug	1,039,639	2,241	0	1,759	0
Sept	833,706	1,979	395	1,169	20
Oct	617,912	1,287	27,383	437	74
Nov	526,322	1,180	56,895	193	113
Dec	541,329	1,168	68,285	195	127
Total	8,509,402	2,273	432,554	9,052	168

Building Energy Consumption = 227,094 (Btu/Sq Ft/Year) Source Energy Consumption = 416,723 (Btu/Sq Ft/Year)

Floor Area = 318,361 (Sq Ft)

USE FOR NEW BOILER BURNERS

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 3
NEW BOILER BURNERS DERATED TO 22000 LB-H

------ MONTHLY ENERGY CONSUMPTION -----

	ELEC	DEMAND	GAS		GAS DMND
	On Peak	On Peak	On Peak	WATER	On Peak
Month	(kWh)	(kW)	(Therm)	(1000 GL)	(Thrm/hr)
Jan	511,676	1,114	50,208	146	83
Feb	475,678	1,114	38,343	122	75
March	543,444	1,187	22,807	163	47
April	569,249	1,252	13,947	310	35
May	813,130	1,846	822	1,040	11
June	928,625	2,106	138	1,470	5
July	1,074,559	2,273	409	1,891	20
Aug	1,039,085	2,241	0	1,756	0
Sept	832,938	1,979	302	1,169	8
Oct	610,505	1,287	11,063	405	30
Nov	517,652	1,180	23,940	151	51
Dec	532,371	1,154	29,676	151	59
Total	8,448,912	2,273	191,656	8,773	83

Building Energy Consumption = 150,778 (Btu/Sq Ft/Year)
Source Energy Consumption = 335,127 (Btu/Sq Ft/Year)

Floor Area = 318,361 (Sq Ft)

USE FOR NEW BOILER BURNER

ject: ENERGY ENGINEERING ANALYSIS I	PROGRAM (EEAP)
roject number	
temporary:	program year
permanent:	category code
int of contact:	
ser name <u>Maj. James Fletcher</u>	date28 August 1991
titleChief of Logistics	phone (913) 239-7207
	autovon
fae name <u>Larry Stillwagon</u>	date20 August 1991
titleBase Energy Officer	
	autovon
engineer district name <u>Robert Miller</u>	date28 August 1991
title Project Manager	
	autovon
other (A-E) name Randall D. Frymire	date27 August 1991
title Project Manager	
	autovon
viewed by:	
nstallation facility engineer name Larry Stillwagon	date28 August 1991
	phone(913) 239-2371
	autovon
oproved by:	
macom engineer	
name	date
title	phone
	autovon

project development brochure, PDB-1

facility

IRWIN ARMY COMMUNITY HOSPITAL FT. RILEY, KANSAS

project coordinator for using service

LARRY STILLWAGON
BASE ENERGY OFFICER

functional requirements summary, PDB-1

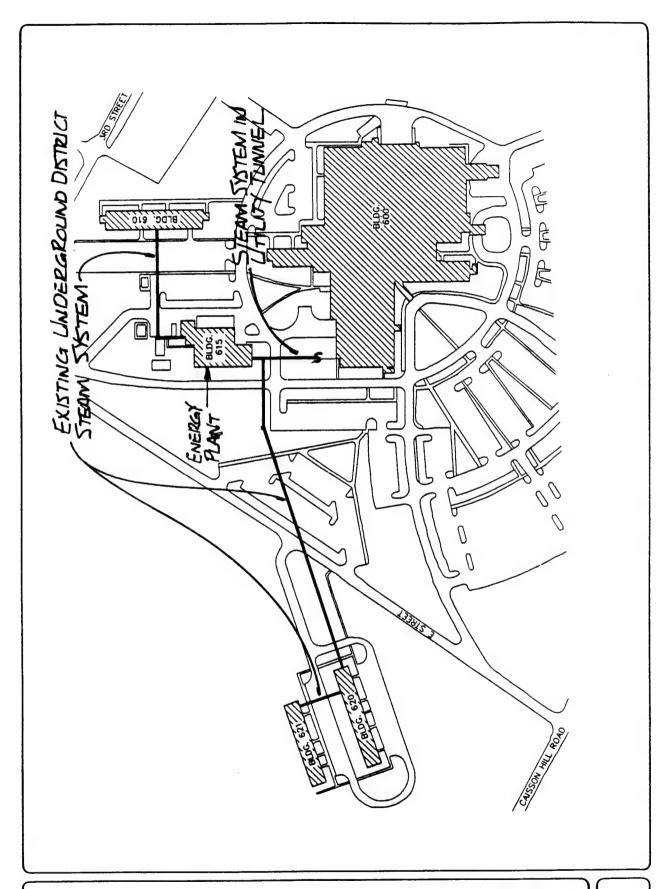
OBJECTIVE

The objective of this project is to install new gas fired, high-efficiency modular boilers in each of three buildings (Nos. 610, 620, and 621) to heat domestic hot water and building water for heating and to install high-turndown gas-fired, high-efficiency burners in the hospital energy plant boilers for the reduced heating requirements of the hospital.

The modular boilers in Buildings 610, 620, and 621 would replace the present underground district steam system to these buildings generated at the hospital energy plant and reduce the gas consumption with the high-efficiency boilers and reduced heat loss through piping and heat exchangers.

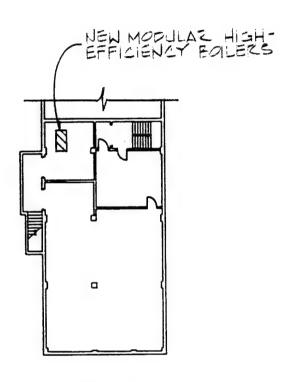
The high-turndown burners will reduce gas consumption due to a higher efficiency at low part loads than the older boilers currently in use.

functional requirements summary, PDB-1



facilities requirements sketch, PDB- ½

DA FORM 5022-R, Feb 82

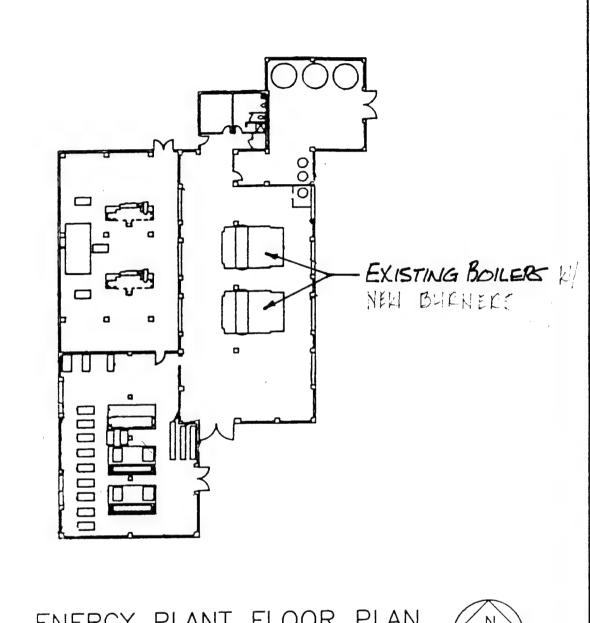


BUILDING 610 BASEMENT FLOOR PLAN



facilities requirements sketch, PDB- ½

DA FORM 5022-R, Feb 82

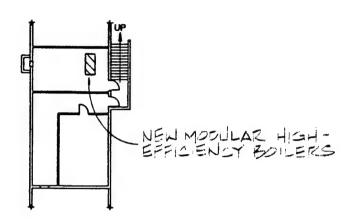


ENERGY PLANT FLOOR PLAN



facilities requirements sketch, PDB- ½

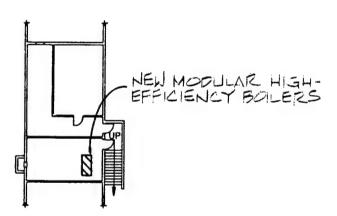
DA FORM 5022-R, Feb 82



BUILDING 620

BASEMENT FLOOR PLAN





BUILDING 621

BASEMENT FLOOR PLAN



facilities requirements sketch, PDB- ½

A. SPECIAL CONSIDERATIONS

		2 0	=	6 6	5 9
	ITEM	Required Not Requ	To Be Determin	Comment	Documen Attached
A-1	Cost estimates for each primary and supporting facility	7			1,
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NZ			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse ecoordination, etc.)	N. N. S. S. S. S. S. S. S. S. S. S. S. S. S.			
A-4	Assignment of airspace	N/Z			1
A-5	Economic analysis of alternatives	177			
A-6	Approval for new starts	110			
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	NZ			
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	112			
A-9	Exceptions to established criteria	117			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	LZ			
A-11	Identification of related or support projects (so projects can be coordinated)	1112			
A-12	Required completion date				
	Other Special Considerations (List and number items) .	1.7-	ı		

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED - Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-A-R, Feb 82

B. SITE DEVELOPMENT

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	ITEM		Required o	To Be Determine	Comment Attached	Document Attached
8-1	Consultation with the District Office to determine and evaluate flood plain hazards		112			
8-2 (A)	Preparation, submission, and/or approval of new General Site Plan					
(B)	Annotated General Site Plan	-				
(c)	Sketch Site Plan	\dashv				
(0)	Facilities Requirements Sketch	-				
B-3	Preparation of			·		
(A)	Site Survey		1 /			
(8)	Subsoil information			_		_
B-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan		1.2			
	Other Site Development Considerations (List and number items)		12	-		
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REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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 $\mbox{COMMENT ATTACHED} = \mbox{Significant information summarized or explained} \\ \mbox{and attached.}$

DOCUMENT ATTACHED — Significant Information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-B-R, Feb 82

C. ARCHITECTURAL & STRUCTURAL

\equiv		B. E.	To Be Determ	Comme	Docume
	ITEM	Require Not Rec	P O	Att	ŏ ¥
C-1	Reconciliation with troop housing programs and requirements	17.			
C-2	Evaluation of existing facilities (including degree of utilization)	1 5			
C-3	Approval for removal and relocation of existing useable facilities	1.7			
C-4	Evaluation of off-post community facilities	1.2			
C-5	Storage and maintenance facilities (including nuclear weapons)	1.7			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	117			
C-7	Coordination of aviation facilities with FAA	112			
C-8	Coordination air traffic control and navigational aids with USACC	117			
C-9	Tabulation of types and numbers of aircraft	NE			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	113			
C-11	Coordination chapels with Chief of Chaplains	115			
C-12	Review food service facilities by USATSA	112			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	MZ			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	112	l		
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	1.17			
C-16	Tenant facilities coordination with installation where sited	NIZ			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	112			
	Analysis of deficiencies	112			
C-18	Consideration of alternatives	NS			
C-19	Determination whether occupants will Include physically handicapped or disabled persons	112			
C-20	As-build drawings for alterations or additions	112			
C-21	Availability of Standard Design or site adaptable designs	11-			
C-22	Other Architectural & Structural (List and number items)	N2			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED - Significant information summarized or explained

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

 $\mathsf{D} = \mathsf{Designer}$

E — Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-C-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

	D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS	Required or Not Required	* nined	ent ed	ed ed
	ITEM	Requir Not R	To Be * Determined	Comment Attached	Document Attached
D-1	Fuel considerations and cost comparison analysis	112			
D-2	Energy requirements appraisal (ERA)				
D-3	Conformance with DOD Energy Reduction requirements				
D-4	Evaluation of existing and/or proposed utility systems	115			
	Other Mechanical and Utility Systems (List and number items)				

REQUIRED OR NOT REQUIRED - Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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COMMENT ATTACHED - Significant information summarized or explained and attached.

DOCUMENT ATTACHED - Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

B - Using Service

C - Construction Service

D - Designer

E - Other (Check Comments Attached and

documentation checklist

DA FORM 5023-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

\equiv		Required Not Req	To Be Determi	Commer Attached	Docume	
	ITEM		ř å	రి₹	۵×	1
E-1	Environmental impact assessment	MZ				Ŧ
E-2	EIA conclusions require Environmental Impact Statement	1.7-				-
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)					
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level	1.7.				
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.	12/				
	Other environmental considerations (list and number items)	115				
						١
						ل

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-E-R, Feb 82

A. SPECIAL CONSIDERATIONS

		9 6	• E	£ 5.	Ē
	ITEM	Require Not Rec	To Be Determi	Comme	Docume
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	PIS FIX			
A-2	Construction phasing requirements	NR	<u> </u>		
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in				
A-4	Equipment in place and justification				
A-5	Other equipment and furniture (O&MA, OPA) and costs	-			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	-			
A-7	Type of construction (permanent, temporary, semi-permanent)				
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	-			
	Other special considerations (list and number items)				

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project.

Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently evailable. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

#BY WHOM (Chéck and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E - Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-A-R, Feb 82

B. SITE DEVELOPMENT

	ITEM	Required Not Requ	To Be Determin	Comment	Documen Attached	
B-1	Construction restrictions or guidelines pertaining to					
(A)	site access and preferred construction routes	-				1
- (B) 	Airfield clearance, explosive storage, working hours, safety, etc.					١
(C)	Facilities and/or functions or adjoining areas (structures, materials, impact)					
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)		·			
8-3	Demolition/relocation required (data)					
(A)	Special considerations due to explosives/radioactivity/ chemical contamination/asbestos emissions/toxic gases	1:3				
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste	118				
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	1 17				
B-5	Landscape considerations					
(A)	Protection of existing vegetation		12.		L -	-
(B)	Stockpile topsail	_	<u> </u>			1
	Other Site Development (List and number items)					

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E - Other (Check Comments Attached and explain)

technical data checklist

C. ARCHITECTURAL & STRUCTURAL

	ITEM	Required Not Requ	To Be Determine	Comment Attached	Document Attached
-	T	αž	Få	0₹	ŏĕ
C-1	Vibration-producing equipment requiring isolation				
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	2	5		
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)				
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	-			
C-5	Designation and strength of units to be accommodated	7			
C-6	Requirements and data for special design projects	117			
C-7	Unusual floor and roof loads (safes, equipment)	112			·
C-8	Security features (arms rooms, vaults, interior secure areas)	12			
	Other Architectural & Structural (List and number items)				

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED - Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-C-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

		i ed	ë.	ner.	E 4
	ITEM	Required Not Requ	To Be Determin	Comment	Documen Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)				
D-2	Special peak usage periods and peak leveling techniques	113			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)		5		
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	-	0_		
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	12	2		
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	-	1		
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	R	<u>-</u>		
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	1/	7		
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	12			
D-10	Solar energy evaluation	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

 $\label{eq:comment} \textbf{COMMENT ATTACHED} = \textbf{Significant information summarized or explained} \\ \textbf{and attached.}$

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

- A DFAE
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

technical data checklist

Required or Not Required E. ENVIRONMENTAL CONSIDERATIONS To Be * Determined Comment ITEM E-1 Waste water treatment, air quality, and solid waste disposal criteria Other Environmental Considerations (List and number items)

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source,

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E — Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-E-R, Feb 82

Required or Not Required F. FIRE PROTECTION To Be * Determined Comment Attached ITEM NR Special fire protection systems or features (detection and suppression equipment, hazards, etc.) F-1 Other Fire Protection Considerations (List and number items)

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

 $\label{eq:comment} \mbox{COMMENT ATTACHED} = \mbox{Significant information summarized or explained} \\ \mbox{and attached.}$

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

#BY WHOM (Check and insert appropriate letter)

- A DFA
- B Using Service
- C Construction Service
- D Designer
- E Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-F-R, Feb 82

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE.	E ANALY	/SIS	y Is USAC	ji,	INVITAL	INVITATION/CONTRACTOR	CTOR	EFFECTIVE PRICING DATE January 1992	RICING DA	TE	DATE PREPARED April 1992	я є р 92	
PROJECT Irwin Army Community Hosp	Hospital -	EEAP			CODE (C)	CODE (Check one)	۲	BURNE E	MOD.	BCILER	SHEET	0 40	SHEETS
Kansas] [OTHER]	ESTIMATOR	MAB		CHECKED BY	Frymire	
	QUANTITY	П			LABOR		EQ	EQUIPMENT	MA	MATERIAL		HS SH	SHIPPING
TASK DESCRIPTION	NO. OF UNITE	MEAS	MH UNIT	TOTAL HR8	UNIT	COST	PRICE	cost	PRICE	COST	TOTAL	TW	TOTAL
SHEET COFF											111,400		
SHEET 3 OF 6						•					41,969		
SHEET 4 OF 6											21,115		
SHEET 5 OF 6											31,7114		
SHEET 6 OF 6											15,761		
SUBTOTAL											6-13,959		
SUBCONTRACTOR OH @	15%										44,094		
SUBCONTRACTOR PROFIT @	0 10%										29,376		
SUBTOTAL											5/1/4/19	1	
GEN. CONTRACTOR OF	<i>હ</i> ો	15%									55,111		
JEN. CONTRACTOR FR	FROFIT	<i>(S)</i>	10%								36745		
SUBTOTAL											459,311		
CONTINGENCIES (2)	5.5%										2543		
CONSTRUCTION COST											3.5487		
510H @ 670											24,074		
TOTAL THIS SHEET											1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
MA TONIS ELLE D. A													

COST ESTIMATE ANALYSIS	F ANAL	YSIS			INVITATI	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	4ED	
use of this for	t; the propo	nent egeno	y le USAC	SE.				Janua	January 1992	6	April 1992	1992	
PROJECT Irwin Army Community Hospital		- EEAP			CODE (Check one)	eck one)	٥	BURNERS NO.	/Mob.	BOHEK	SHEET	0 00	SHEETS
LOCATION Fort Riley, Kansas						ОТНЕЯ		ESTIMATOR	MAB		CHECKED BY	Fromire	
	QUA	QUANTITY			LABOR		EOI	EQUIPMENT	ž	MATERIAL	i i	HS	SHIPPING
TASK DESCRIPTION	NO. OF UNITS	UNIT	MH UNIT	TOTAL HRS	PRICE	COST	UNIT	COST	PRICE	COST	TOTAL	TINO	TOTAL
ENERGY FLANT													
GENERAL DEMOLITION	_	2									2000		
PACKAGE 22,00 MBH													
GURNERS	(cz	EA			13,000	020195	0001	4400	5745	114,900	142,900		
GAS TRAIN INSTALLATION		2	ı							and the state of t	122(2)		
BOILE & MODIFICATIONS		1.5					İ		İ		3500		
START-UR/CHECK-CUT		15			-		ļ				220,21		
	·												
TOTAL THIS SHEET											1711,460		
DA CAMPAGE DA A OF													

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent agency is USACE	FE ANAL	YSIS nent agen	cy is USA		INVITATI	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE January 1992	STIVE PRICING DA January 1992	ATE 2	DATE PREPARED April 1992	1992	
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)	eck one)	۲	BURNERS	Mob.	BOILER	SHEET	0 40	SHEETS
I ~] [OTHER	1	ESTIMATOR	070		CHECKED BY	Fromfre	
	QUA	QUANTITY			LABOR		EOI	EQUIPMENT	W	MATERIAL		S	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	MH UNIT	TOTAL	PRICE	COST	UNIT	COST	PRICE	COST	TOTAL	TIND	TOTAL WT
GAS FIRED EVILERS													
PUVA. 610						•							
HEAT	4	EA			1050	4200			2005	11220	15420		
BA, HA	7	以			805	1130			2245	4490	0220		
20 ELDA C.20													
TAZ	W	EA			28	2340			(130	5190	7530		
MH. MOJ	_	EA			220	820			1949	1949	2769		
ELDS, 62													
HEAT	ω	4			180	2340			1720	5190	7530		
DOM. HW	_	EA			180	180			1720	1720	2500		
TOTAL THIS SHEET											41969		
DA FORM 5418-R, Apr 86													

COST ESTIMATE ANALYSIS	FE ANALY	SIS			INVITATI	INVITATION/CONTRACTOR	T	EFFECTIVE PRICING DATE	RICING D.	4TE	DATE PREPARED	ED	
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PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)	eck one)	٥	BURNERS /	JMOD/	BOILER	SHEET 4	000	SHEETS
LOCATION Fort Rilay Kansas					<u>[</u>		1	ESTIMATOR	1000		10		1
	QUANTITY	TITY			LABOR	1	Eau	EQUIPMENT	X	MATERIAL	K. U.	rrymire SHII	SHIPPING
TASK DESCRIPTION	NO. OF UNITE	UNIT MEAS	MH CNIT	TOTAL	PRICE	COST	PRICE	COST	PESCE	COST	TOTAL	TW	TOTAL
BLR RUE & MITINGS													
	150	<u>U</u>	1		9.50	1425			13.50	2005	3450		
BLD4, 020 (4")	001	5			9.50	950			15.50	1350	0.252		
ELCA, 621 (+)	00	n			9.50	256]	13.50	1350	5300		
MIS. PIPING WINSUL.													
EL DG 610		7 U				1716				640	2350		
B1.04 610		1.5	١			1140				430	1510		
BUDG 621	_	15				1140				430	1570		
MOD. BOILER CONTROLS	W	EA							4525	13515	13575		
TOTAL THIS SHEET										i	37115	1	
DA EORM SAIS-R Any 26													

DA FORM 5418-R, Apr 85

COST ESTIMATE ANALYSIS	E ANALY	SIS			INVITAT	INVITATION/CONTRACTOR	STOR	EFFECTIVE PRICING DATE	RICINGD	ATE	DATE PREPARED	aeo	
For use of this form, see TM 5-800-2; the proponent agency is USACE.	; the propor	nent agent	y is USAC	JE.				Janua	January 1992	2	Apr11 1992	1992	
PROJECT Irwin Army Community Hospital	pital -	EEAP			CODE (Check one)	eck one)	٥	BURNERS /	/MOP.	BOILFR	SHEET 5	9 20	SHEETS
LOCATION Fort Riley, Kansas					[отнея		ESTIMATOR	四月	_	снескер ву В. D.	Frymire	9
	VTITNAUD				LABOR		EQI	EQUIPMENT	ž	MATERIAL		S	SHIPPING
TASK DESCRIPTION	NO. OF	MEAS	MH UNIT	TOTAL	UNIT	COST	PRICE	COST	PRICE	COST	TOTAL	TW	TOTAL
WATER HTR W/PUMP				٠.١									
BLD9 610 (180 m)	1	EA			213	213	l		9476	9476 9476	9689		
ELG (200 (200 (20)	_	EA	-		8	138			6480	6980	7118		
ELDG (SO (300 GW)	-	EA			105	105			2005	5002	5107		
GAS PIPING WFITTINGS	o.												
(i) 010 sala	400	L,			3.25	1300			w L	1486	2780		
PLDS 620 (2)	9001	<u>ت</u>	1		3.5	3500			12.4	42.0	7710		
BLC4 (22) (1)	300	r n	ı	1	3.25	975	I		3.7	110	2085		
EXPANSION TANKS	W	EA	1		35	105			1040	3120	3228		
TOTAL THIS SHEET											37714	ì	

COST ESTIMATE ANALYSIS	TE ANA!	Vele			INVITATI	INVITATION/CONTRACTOR		EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	ED	
use of this for	t; the propo	nent agen	EV IN USAC					Janua	ry 199	2	April 1992	992	
PROJECT Irwin Army Community Hospital	1	- EEAP			CODE (Check one)	eck one)	۲۷	BURNEES/1900. BOILER	MOD. 1	ZOILEK	SHEET 6	0 0	SHEETS
LOCATION Fort Rilev. Kansas						DITHE B	1	ESTIMATOR	200		CHECKED BY	D'man f	
	QUA	QUANTITY]	LABOR		E	EQUIPMENT	M	MATERIAL	V. D.	HS SHI	SHIPPING
TASK DESCRIPTION	NO. OF UNITS	UNIT	MH UNIT	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TIND	TOTAL
BLDG 610, 6504621	W	EA			2001	3000					3000		
DEMO, OF EQUIP RM.						·							
MIS. ELECT.	W	EA			350	1050			150	450	1500		
CIRC. PUMPS			**										
4610		EA			26	26			0201	1070	2911		
# 620		EA			26	26			260	693	752		
129#	_	EA			26	26			2013	ELC.	256		
NEW GASLINE													
CKFILL	1200	<u>1</u>			2.0	2400	0.75	900	-		3300		
REGULATING STATIONS	6.2	EA			300	909			2001	2002	2600		
NEW HW BOILERS													
TEST & BALANCE	_	EA			135	2295					2000		
TOTAL THIS SHEET											15761		
DA FORM SATE BY AND ME													

5. CHILLER REPLACEMENT

1. COMPONENT ARMY	FY 19 95 MILITARY CON	STRUCTION PROJECT DATA	2. DATE 19 APR 1992 14 APR 1992
3. INSTALLATION AN	D LOCATION	4. PROJECT TITLE	
Fort Riley		ECIP	
Kansas		Chiller Replacement	

8. PROJECT COST (\$000) 7. PROJECT NUMBER 6. CATEGORY CODE 5 PROGRAM ELEMENT 40474 860 510 10

9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
PRIMARY FACILITY Chiller Replacement	EA	2	349026	698 (698)
SUPPORTING FACILITIES Design Cost	LS			42 (42)
ESTIMATED CONTRACT COST CONTINGENCY PERCENT (10.0%) SUBTOTAL SUPERVISION, INSPECTION & OVERHEAD (6.00%) CATEGORY E EQUIPMENT TOTAL REQUEST TOTAL REQUEST (ROUNDED) INSTALLED EQUIPMENT-OTHER APPROPRIATIONS				740 74 814 49 (0) 863 860 (0)

10. DESCRIPTION OF PROPOSED CONSTRUCTION

The project includes removing the three existing 200 ton steam centrifugal chillers and their associated condensers, pumps and accessories. Install two new gas engine-driven chillers with associated piping, pumps, expansion tanks, controls and electrical. One of the two chillers will be sized to provide cooling for the winter load. The heat recovered from the engine is used to preheat make-up water to the boiler and for reheat system hot water.

11. REQUIREMENT:

PROJECT:

Replace the three 200 ton steam driven centrifugal chillers with two larger gas engine-driven chillers with one sized for just the winter load. Install new gas piping, pumps and accessories.

REQUIREMENT:

This project is required to reduce the chiller system inefficiencies, large annual maintenance costs, and reduce summer peak electrical demand costs.

DD FORM 1391

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1. COMPONENT

ARMY

FY 19 95 MILITARY CONSTRUCTION PROJECT DATA

2. DATE

19 APR 1992 14 APR 1992

1 INSTALLATION AND LOCATION

Fort Riley

Kansas

4 PROJECT TITLE

ECIP

Chiller Replacement

S. PROJECT NUMBER

40474

CURRENT SITUATION:

The existing 200 ton steam centrifugal chillers are past their useful life and are a continuous maintenance and repair problem. Under present operation the two new 475 ton electric centrifugal chillers are sequenced on first. The steam chillers are mainly used to handle the additional summer load even though they are smaller than the two TRANE electric centrifugal chillers. The present off-peak season load is provided by a large capacity chiller operating at low partial load which decreases the chiller efficiency.

IMPACT IF NOT PROVIDED:

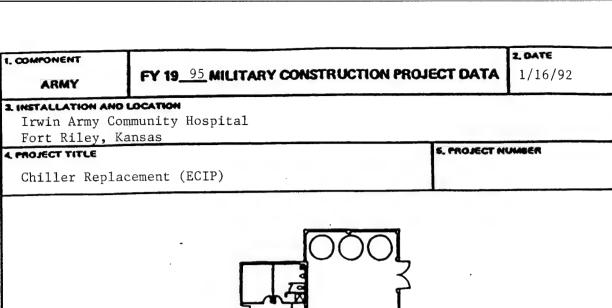
Failure to approve this project will result in continued operating inefficiencies and large annual repair costs to the three steam centifugal chillers. Great inconvenience is now caused while the existing chillers are down for repairs.

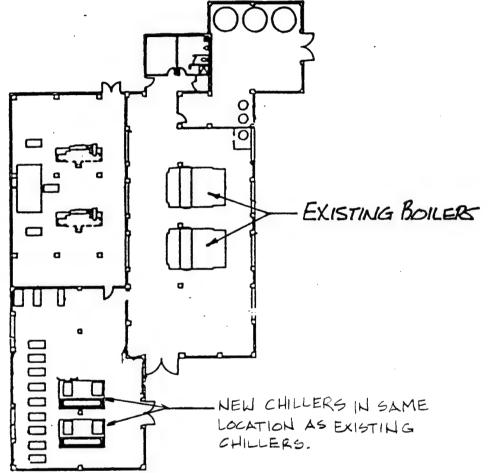
ADDITIONAL:

This project complies with the scope and design criteria of CEHSU-FU-M, Energy Conservation Investment Program (ECIP) Guidance, that was in effect June 1991. The individual project has a Discounted Savings Ratio (SIR) of 1.86 and a simple payback of 8.93 years. The implementation of this project will save 2,464 MBTU/Yr and \$85,166/Yr.

Project validation will be through the use of metering gas flow and metering electric consumption at the Energy Plant. Comparison of total annual gas and electric consumption along with boiler/chiller operating logs and engineering calculations will be utilized.

FSTIMATED	CONSTRUCTION START:	APR	1995	INDEX:	1992
	MIDPOINT OF CONSTRUCTION:	OCT	1995	INDEX:	
	CONSTRUCTION COMPLETION:	APR	1996	INDEX:	2055





ENERGY PLANT FLOOR PLAN



DD FORM 1391c

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UNTIL EXHAUSTED

PAGE NO.

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INTRODUCTION

This project concerns replacing the three existing 200 ton capacity steam-driven centrifugal chillers. The existing steamdriven chillers are now 36 years old which is approximately 11 years beyond their projected useful life. The existing chillers are a continuous maintenance and repair problem both in time and Due to the undependable state of the existing steam centrifugal chillers, they are not used to base load the plant. Because of this facility's need for a minimum amount of yearround cooling, it is generally more efficient to base load with the smaller capacity chillers first to reduce the part load hours Chillers are more efficient when loaded at peak of operation. In this project, one of the two new chillers would be sized to be used in the off-peak season to closely match the winter load required by the Nursery/Delivery and Surgery air handling units which require mechanical cooling all year.

Three different types of chillers were reviewed but only the gasfired engine-driven units with heat recovery had a payback of 10 years or less. The other two chiller options studied were electric centrifugal and direct gas-fired absorption with heat recovery. This project deals only with the gas-fired enginedriven chiller.

Due to available unit sizes one 250 ton and one 500 ton unit would be installed to replace the three existing 200 ton machines. From the manufacturer's data the 250 ton chiller full load gas input is 1,785 MBH and the 500 ton chiller is 3,570 in both the cooling and heat recovery mode.

The recoverable heat from the engine cooling jacket and exhaust manifold for the 250 ton unit is 850 MBH and for the 500 ton unit is 1,700 MBH. The heat available for recovery would be utilized to preheat boiler feed water and to provide heat for the hospital building reheat system. To recover this heat, heat exchangers are furnished with the chillers and new circulating pumps, piping and valves will be installed.

ASSUMED CONDITIONS

Gas Cost = 3.7 \$/MCF

Electric Cost = 0.038 \$/KWH

Annual maintenance and repair cost for new chillers is \$4,300 for 250 ton unit and \$6,700 for 500 ton unit.

Gas engine-driven chiller engines are estimated to last 20,000 equivalent full load hours before replacement is required. Estimated replacement cost is \$6,000/engine.

Equivalent full load hours for 250 ton unit are estimated at 5,500/year and for 500 ton unit at 2,200/year.

Annual repair and maintenance cost for existing chillers is \$15,000 or \$5,000 each.

Replacement savings = The two Carrier steam chillers are already 11 years beyond the 25 year useful life estimated by ASHRAE. A replacement cost in year one of the study is included as a nonrecurring savings. The York steam centrifugal chiller was installed 23 years ago. The service life given by ASHRAE is 25 years. The chiller would be replaced in year three of the study.

LIFE CYCLE COST ANALYSIS SUMMARY ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCAT	ION: Fort Riley, K	s. REGION No	0.:7	PROJECT N	NO.: <u>40474</u>
PROJE	CT TITLE: Chiller	Replacement		FISCAL YR.:	1995
DISCR	ETE PORTION NAME:	Replace Chi	llers		
ANALY	'SIS DATE: 4-15-92	ECONOMIC LIF	E 25 YEARS	PREPA	ARED BY: RDF
1. INV	ESTMENT				
	CONSTRUCTION COST	Γ	\$ 692538		
	SIOH		\$ 41553	_	
	DESIGN COST		\$ 41553		
	SALVAGE VALUE		\$ 15221	_	\$ 760423
E.	TOTAL INVESTMENT (1	A + 1B + 1C - 1	D)	;	\$
	ERGY SAVINGS (+) / C			NITED ON INCO	
ANA	ALYSIS DATE ANNUAL				DICCOUNTED
		SAVINGS			
FUE	EL \$/MBTU/YR(1) MBTU/YH(2)	SAVINGS(3)	FACTOR(4)	SAVINGS(5)
Δ	ELEC \$ 11.13	5391	\$ 60,002	15.04	\$ 902428
	DIST \$		\$		\$
C	RESID S		\$		\$
D.	NG \$ 3.59 COAL \$	-2927	\$-10,508	18.92	\$ -198810
E.	COAL \$		\$		\$
F. '	TOTAL	2464	\$ 49,494		\$ <u>703618</u>
	NENERGY SAVINGS (+	•			
	ANNUAL RECURRING		1/ (0	\$ <u>15992</u>	
((1) DISCOUNT FACTO	R (TABLE A)	14.68	→ 23/4763	
((2) DISCOUNTED SAVI	NGS/COST (3A X	3A1)	\$ 234703	
_	NONDEOLIDDINO OAVII	NOC (.) / COST	(1)		
В.	NONRECURRING SAVI	NGS (+) / COST	(-)		DISCOUNTED
	ITEM	SAVINGS(+)	YEAR OF	DISCOU	
		COST(-)(1)	OCCURRENC	E(2) FACTOR	R(3) (+) COST (-) (4)
(1)	Replace Chillers	\$ 368,000	1	96	\$ 353280
(2)	Chiller Replac		3	.87	\$ 160080
(3)	Engine Replace		4	.84	\$ -5040
(4)	Engine Replace		8	.70	\$ -4200
(5)	Engine Replace		9	.67	\$ 8040
(6)	Engine Replace		12	58	
(7)	Engine Replace	\$6,000	16	.49	
(8)	Engine Replace	\$12,000	18	45_	\$ -5400
(9)	Engine Replace	\$ <u>-6,000</u>	20	41	\$ - 2460
(10)			24	34_	\$2040
	TOTAL	\$ 492,000			\$ 479760

	C. TOTAL NONENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2 + 3	3D4) \$ 714523
	D. PROJECT NONENERGY QUALIFICATION TEST (1) 25% MAX NONENERGY CALC (2F5 X .33) \$ 232194 a. IF 3D1 IS = OR > 3C GO TO ITEM 4 b. IF 3D1 IS < 3C CALC S1R = $(2F5 + 3D1) / 1E = 1.23$ c. IF 3D1b IS = > 1 GO TO ITEM 4 d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY	
4.	FIRST YEAR DOLLAR SAVINGS 2F3 + 3A + (3B1d / YEARS ECONOMIC LI	FE)\$ 85,166
5.	TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C)	\$ _1418140
6.	DISCOUNTED SAVINGS RATIO (IF < 1 PROJECTS DOES NOT QUALIFY) (S	SIR) = (5/1E) =
7.	SIMPLE PAYBACK PERIOD (ESTIMATED YEARS) SPB = 1E/4	8.93



JOB Irwin EEAP - Ft. Riley, Ka	ınsas
SHEET NO.	OF
CALCULATED BY MM	DATE 4-1992
CHECKED BY 2DF	DATE 4-1992
JOB NO. <u>5080</u>	•

MEH ENGINE DRIVEH CHILLERS

INSTALL ONE 230 TON GAS FIRED ENGINE DRIVEN CHILLER AND ONE 460 TON GAS FIRED ENGINE DRIVEN CHILLER WITH HEAT RECOVERY. THE CHILLER PLANT SEQUENCE IS AS FOLLOWS:

- 1. NEW 230 TON , I.GA MCF INPUT , 850 MBH RECOVERY
- 2 NEW 460 TON; 34 MUF INPUT, 1700 MBH RECOVERY
- 3. EXISTING 475 TON, 4100 KW INPUT
- 4 EXISTING 475 TON, 466 KW INPUT

THE EHERGY LIGED BY THE HOSPITAL ONLY AS IT NOW OPERATES WAS CALCULATED USING THE TRANE "TRACE" PROGRAM IN FILE TOILSOND ALTERNATIVE I. THE 3 EXISTING STEAM DRIVEN 200 TON CHILLERS WERE REPLACED BY THE TWO NEW CHILLERS IN ALTERNATIVE 2.

THE HEAT RECOVERY AVAILABLE FROM THE HEW CHILLERS IS USED TO PREHEAT 20 GPM OF BOILER FEEDWATER FROM 195°F TO 225°F AND HEAT 6 GPM OF BOILER MAKEUP WATER FROM 60°F TO 225°F. ANY ADDITIONAL HEAT 16 REJECTED TO THE TERMINAL REHEAT SYSTEM IN THE 1975 ADDITION, THE TOTAL AMOUNT OF HEAT RECOVERY AVAILABLE FROM THE CHILLERS IS 2550 MBH. THE TOTAL AMOUNT OF HEAT RECOVERY UTILIZED 15 26 GPM x (225-195°F) x 500 = 300

20 GPM x (225-195°F) x 500 = 300 6 GPM x (225-60°F) x 500 = 495 TERMINAL REHEAT PEAK LOAD = 1700 2495 MBH



JOB Irwin EEAP - Ft. Riley	y, Kansas
SHEET NO.	OF
CALCULATED BY	DATE 4-1992
CHECKED BY RDF	DATE 4-1992
JOB NO. <u>5080</u>	

CONTINUED

THEREFORE 98% OF AVAILABLE HEAT RECOVERY LAN BE USED.

THE RECOVERY HEATING WATER LOOP WILL BE PIPED IN PARALLEL WITH THE EXISTING HEAT EXCHAUGER FOR BOILER HEATING BACKUP.

BASED ON THE TRACE PROGRAM OUTPUT THE DIFFERENCE IN ELECTRICAL ENERGY CONSUMPTION 15 AS FOLLOWS:

ELECTRICAL FROM PAGES 10 & 11.

TØ115080 ALT 1 8414952

TØ115080 ALT 2 6835379

1,579,573 KWH

MONTHLY ELECTRICAL CONSUMPTION
TO115080 ALTERNATE 1
EXISTING EQUIPMENT

HTHOM	ELEC KWH	ELEC KW
JAN	540,643	1,096
FEB	485,716	1,096
MAR	546,262	1,185
APR	548,104	1,235
MAY	800,720	1,839
JUN	922,004	2,108
JUL	1,069,322	2,272
AUG	1,034,951	2,242
SEP	822,078	1,978
OCT	589,348	1,274
NOV	520,457	1,178
DEC	535,347	1,166
TOTAL	8,414,952	2,272

* USE FOR ELECTRICAL CONSUMPTION AND DEMAND SANINGS

MONTHLY ELECTRICAL CONSUMPTION TO115080 ALTERNATE 2 ENGINE DRIVEN CHILLERS

MONTH	ELEC KWH	ELEC KW
JAN	489,153	985
FEB	441,597	985
MAR	494,032	1,036
APR	481,734	1,133
MAY	627,350	1,341
JUN	679,873	1,741
JUL	757,823	1,811
AUG	753,348	1,799
SEP	637,992	1,675
OCT	515,887	1,133
iov	471,297	1,035
DEC	485,295	1,034
TOTAL	6,835,381	1,811

* USE FOR ELECTRICAL CONSUMPTION AND DEMAND SAVINGS



JOBIrwin	EEAP - Ft. Riley	, Kansas	
SHEET NO.		OF _	· · · · · · · · · · · · · · · · · · ·
CALCULATED BY _	MM	DATE	4-1992
CHECKED BY	RDF	DATE	4-1992
JOB NO5080)		

THE HET ADDITIONAL GAS USED BY INSTALLING GAS ENGINE DRIVEN CHILLERS

(CHILLER INPUT - HEAT RECOVERY) IS CALCULATD

USING THE BUILDING LOAD PROFILE AND THE MANUFACTURE PART LOAD PERFORMANCE CURVE.

PEFER TO PAGES 13, 14, 15, 16 \$ 17.

GAS INPUT TO NEW CHILLERS = 14,005
HEAT RECOVERED BY NEW CHILLERS = 11,078
ADDITIONAL GAS USED 2,927

= 11,078 2,927 MG

ANNUAL ENERGY SAVING 1,579,573 KWH × 3413 BTU/KWH = 5391×106 -2927 MCF × 1.031×106 BTU/MCF = -2,927×106 2,464×106 BTU/HR

1,579,573 KWH × 0.038 \$/KWH = 60,024 -2,927 MCF × 3,7 \$/MCF = -10,830 49,194 \$/4R



JOB Irwin E	EEAP - Ft. Ril	ey, Kansas
SHEET NO.		OF
CALCULATED BY	MM	DATE 4-1992
CHECKED BY	RDF	DATE 4-1992
JOB NO		

NEW GAS ENGINE DRIVEN CHILLER NO: 1
RATED TONS : 230
FULL LOAD GAS INPUT : 1.69 MCF
OUTPUT : COP = PART LOAD INPUT

% DBS 16 H LOAD 5 10 15 20 252- 25 30 35 40 45 50	TOHS 63 126 189 230	OUTPUT BTUH 756,000 1,512,000 2,268,000 2,760,000	COP 1.75 2.25 2.1 1.7	SPARTLOAD X 2 IHPUT 432,000 672,000 1,623,529	4386 0 405	: 1.031}=	MCF 1837 0 424 6252
55 65 70 75 85 95 100							

TOTAL 8,513 MCF

and the state of the state of the state of the state of the state of the state of the state of the state of the



JOB Irwin	EEAP - Ft. Rile	ey, Kansas
SHEET NO.		OF
CALCULATED BY	MM	DATE 4-1992
CHECKED BY	RDF	DATE 4-1992
JOB NO5080		

NEW GAS ENGINE DRIVEN CHILLER NO 2
RATED TONS :460
FULL LOAD GAS INPUT :3.4 MCF

% DESIGH LOAD TOHS	OUTPUT BTUH	COP	SPARTLOAD & HOURS: 1.0319	= MCF
10 15 20 252-230-22 25 315-230-25 30 317-230-147 35 440-230-210 40 40 40 40-230-273 45 50 629-230-336 50 622-230-460	264000 1,764,000 1,764,000 2,520,000 3,276,000 4,032,000 4,788,000 5,520,000	1.7 2.34 1.1.9.7	155294 757 600,000 273 766,956 382 1,050,000 537 1,560,000 417 1,920,000 349 2,520,000 323 3,247,059 736	114 159 284 547 631 650 789 2318
70 75 80 85 90 95				

TOTAL

5492 MUF



JOB Irwin EEAP - Ft.	Riley, Kansas
SHEET NO.	OF
CALCULATED BY BICT	DATE 4.100-
CHECKED BY RD=	DATE
JOB NO. <u>5080</u>	

NEW GAS ENGINE DRNEH CHILLER NO. 1 RATED TONS: 230 FULL LOAD RECOVERY: 850,000 BOILER EFF = 78% PIPING LOSS EFF = 90%

% DESIGN		90			· · · · · · · · · · · · · · · · · · ·
LOAD	Tons	LOADE	RECOVER × HI	. † 9. †87. † 29 x	031 = MCF
5	43	27	229,500 × 4	385	= 300
10	1260	55 81	467,500 x 697,000 x		= 390
20	230	100	850,000 X		=Alder
25 <i>30</i>		ALL RENIA	INING HOURS	<u>-</u> _)	
35				-	
40 45					
50					
55 40					
45					
7C 75					
80					
£5 90					

95 100

TOTAL

6442 NICF



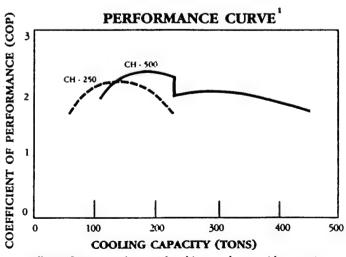
JOB Irwin E	EEAP - Ft. Riley	, Kansas	
SHEET NO.		OF	
CALCULATED BY	BKT	DATE 4. 007	
CHECKED BY	RDF	DATE	
JOB NO5080			

NEW GAS ENGINE DRNEN CHILLER NO. 2 RATED TONS: 46C FULL LOAD RECOVERY 1,700,000 BOILER EFF = 78% PIPING LOSS EFF = 90%

% DESIGN LOAD	Tons	% LOADE	D SRECOVER × HRS + .78+ .	9 : 1.031 = MCF
5 10 15 10 (252-130) 25 (315 - 230) 30 (377- 230) 35 (440-230) 40 (503-230) 45 (504-230) 50 (629-230)	C 0 C 2 2 5 147 2 13 6 3 9 9 4 6 0	0005824937	6 6 6 6 6 6 6 6 6 6 6 6 6 6	= C = C = C = E9 = 1!5 = 287 = 578 = 578 = 598 = 1729
45 70 75 80 45 90 95	Δ L ι	L REMAI	NING HOURS	
TOTAL				46360NCF

Model	CH - 250	CH - 500
Capacity (Tons) ¹	230	460
COP		
Full load	1.7	1.7
Integrated Part Load Value (IPLV)	2.0	2.0
RPM Full Load	3000	3000
Gas Input (SCFH) ² @6 - 28 in. H,O	1750	3500
Recoverable Heat at Full Load (BTU/H) ³	850,000	1,700,000
Acoustic Level (dBA) @ 20 ft.with Optional Enclosure	82	85
Electric Power Requirements	208 VAC Three phase,	208 VAC Three phase,
·	35 Amps Service, 4 kW	50 Amps Service, 7 kW
Chilled Water Flow(GPM)	600 °	1200
Cooling Tower Requirements		
Condenser Flow Rate (GPM)	750	1500
Pressure Drop (ft. H ₂ O)	11	11
Temperatures, without Exhaust Heat Exchangers (°F)3	85.0 - 95.0	85.0 - 95.0
Temperatures, with Exhaust Heat Exchangers (°F)3	85.0 - 96.3	85.0 - 96.3
Exhaust		
Without Exhaust Heat Exchangers ³	4 in. ANSI Flange, 300 SCFM, 26 in. of water max. back pressure, 1200°F max. temperature	(Same per engine)
With Exhaust Heat Exchangers ³	4 in. ANSI Flange, 300 SCFM, 16 in. of water max. back pressure, 300°F max. temperature	(Same per engine)
Refrigerant	R-11(1,010 lbs.)	R-11 (1,770lbs)
TecoDrive™ Engines	One	Two
	18,000	26,000

Note 1. Per ARI 550 - 88 Metbod Note 2. HHV 1020 BTU/SCF Note 3. 60% of beat from engine jacket, exbaust manifold and oil cooler; 40% from engine exbaust beat exchanger



All specifications and materials subject to change without notice. All specifications and ratings are +5%

Annual Recurring Maintenance/Repair for Gas Engine-Driven

250 Ton Unit:

Estimated Annual Equivalent Full Load Hour	s: 5,500/yr.
Air Filter: \$20.00 x 2.2 =	44.00
Oil Filter: \$10.00 x 2.2	22.00
Spark Plugs: \$30.00 x 2.2 =	66.00
PVC Valve: \$15.00 x 2.2 =	33.00
Plug Wires: \$30.00 x 2.2 =	66.00
Oil: \$165 x 2.2 =	363.00
Routine maintenance: 80 hrs @ \$38.00/hr	3,040.00
Oil maintenance: 16 hrs @ \$38.00/hr	608.00
	\$ 4,242.00

500 Ton Unit:

Estimated Annual Equivalent Full Load Hours	s: 2,200/yr.
Air Filter: \$20 x 1.0 x 2	40.00
Oil Filter: \$10 x 1.0 x 2	20.00
Spark Plugs: 430 x 1.0 x 2	60.00
PVC Valve: 415 x 1.0 x 2	30.00
Plug Wires: \$30 x 1.0 x 2	60.00
Oil: \$165 x 1.0 x 2	330.00
Routine maintenance: 120 hrs @ \$38.00/hr	4,560.00
Oil maintenance: 40 hrs @ \$38.00/hr	1,520.00
	\$6,620.00



JOB Irwin	EEAP - Ft. Ril	ey, Kansas	
SHEET NO.		OF	
CALCULATED BY	MM	DATE	4-1992
CHECKED BY	RDF	DATE	4-1992
JOB NO. 508	80		

DEMAND SANINGS - NON-ENERGY ANNUAL RECURRING BY LITILIZING GAS FIRED CHILLERS FOR THE BASELOAD INSTEAD OF ELECTRIC CHILLERS THE DEMAND COST IS REDUCED. THE MONTHLY DEMAND COST BASED ON THE ELECTRIC RATE SCHEDULE IS CALCULATED FOR BOTH TYPES OF CHILLERS. REFER TO PAGES 10, 11 \$ 20.

AHNUAL DEMAND COST SAVINGS ALTERNATIVE 1 77,530 ALTERNATIVE 2 65,538 # 11,992

EQUIVELENT FULL LOAD HOURS FOR MAINTENANCE CALC'S THE EQUIVELENT FULL LOAD HOURS FOR THE HEW 250 TON AND 500 TON ENGINE DRIVEN CHILLERS ARE CALCULATED USING THE SYSTEM LOAD PROFILE. THE PLANT IS BASELOADED WITH THE 250 TON CHILLER, THE TOTAL HUMBER OF COOLING HOURS AT EACH 5% INCREMENT UP TO 230 ACTUAL TONS IS MULTIPLIED BY THE CAPACITY AT THAT INCREMENT TO GET TON-HOURS THEN DIVIDED BY THE UNIT TOTAL CAPACITY OF 230 TONS. AS THE LOAD RISES ABOVE 230 TONS THE 500 TON UNIT IS SEQUENCED ON NEXT. ABOVE 230 TONS BOTH CHILLERS ARE ON. THE GAME CALCULATION IS THEN PERFORMED FOR THE INCREMENTS BETWEEN 230 AND 690 TONS. THE NOMINAL GOOTON UNIT PROVIDES 460 TONS OF COOLING. THE 250 TON UNIT CONTINUES TO OPERATE FULLY LOADED. THE ANNUAL RECURRING HON ENERGY MAINTENANCE SAVINGS = 4000 \$.

Total Annual Nonenergy Savings due to reduction in electric capacity charge (demand) calculated using the electric rate schedule.

	EXISTING	SYSTEM	MODIFIE	D SYSTEM	
MONTH	BILLING DEMAND (KVA)	DEMAND CHARGE (dollars)	BILLING DEMAND (KVA)	DEMAND CHARGE (dollars)	SAVINGS
JANUARY	1096	4598.80	985	4149.25	449.55
FEBRUARY	1096	4598.80	985	4149.25	449.55
MARCH	1185	4959.25	1036	4355.80	603.75
APRIL	1235	5161.75	1133	4748.65	413.10
MAY	1839	7607.95	1341	5591.05	2016.90
JUNE	2108	8697.40	1741	7211.05	1486.35
JULY	2272	9361.60	1811	7494.55	1867.05
AUGUST	2242	9240.10	1799	7445.95	1794.15
SEPTEMBER	1978	8170.90	1675	6943.75	1227.15
OCTOBER	1274	5319.70	1133	4748.65	571.05
NOVEMBER	1178	4930.90	1035	4351.75	579.15
DECEMBER	1166	4882.30	1034	4347.70	534.60
TOTAL				\$	11,992.35

NONRECURRING SAVINGS/COST

Since the existing Carrier chillers are beyond their useful life, a nonrecurring savings to replace these units will occur in the first year of the study (+\$368,000.00). In the third year of the study the York chiller will be replaced at a cost of (+\$184,000). In the year 4, 8, 12, 16, 20 and 24 a complete engine replacement will be required for the 250 ton chiller at a cost of \$6,000.00 each. In year 9 and 18 complete engine replacement will be required for the 500 ton chiller at a cost of \$12,000.00 each.

Trane Air Conditioning Economics By: MASSAGLIA-NEUSTROM-BREDSON

HOSPITAL ONLY

V 600 PAGE 1

SYSTEM TOTALS LOAD PROFILE - ALTERNATIVE 1

EXISTING SYSTEMS

System Totals

Percent	Cool	ing Loa	nd	Heati	ng Load		Cooling	Airflow		Heating	Airflow	
Design	Cap.		Hours	Capacity	Hours	Hours	Cap.	Hours		Cap.	Hours	Hours
Load	(Ton)	(%)		(Btuh)	(%)		(Cfm)	(%)		(Cfm)	(%)	
0 - 5	62.9	50	4,385	-890,475	43	3,599	17,334.2	0	0	0.0	0	0
5 - 10	125.8	0	0	-1,780,949	8	699	34,668.5	0	0	0.0	0	0
10 - 15	188.7	5	405	-2,671,424	11	902	52,002.7	0	0	0.0	0	0
15 - 20	251.6	9	757	-3,561,899	10	826	69,336.9	0	0	0.0	0	0
20 - 25	314.5	3	273	-4,452,373	8	678	86,671.2	0	0	0.0	0	0
25 - 30	377.4	4	382	-5,342,848	7	608	104,005.4	0	0	0.0	0	0
30 - 35	440.3	6	537	-6,233,322	5	430	121,339.6	0	0	0.0	0	0
35 - 40	503.2	5	417	-7,123,798	4	298	138,673.9	0	0	0.0	0	0
40 - 45	566.1	4	349	-8,014,272	4	317	156,008.1	0	0	0.0	0	0
45 - 50	629.0	4	323	-8,904,748	0	0	173,342.3	0	0	0.0	0	0
50 - 55	691.9	2	196 -	-9,795,222	0	0	190,676.6	0	0	0.0	0	0
55 - 60	754.8	3	264	-10,685,697	0	0	208,010.8	0	0	0.0	0	0
60 - 65	817.7	2	171	-11,576,172	0	0	225,345.0	0	0	0.0	0	0
65 - 70	880.6	1	109	-12,466,646	0	0	242,679.3	0	0	0.0	0	0
70 - 75	943.5	2	172	-13,357,121	0	0	260,013.5	57	4,985	0.0	0	0
75 - 80	1,006.4	0	20	-14,247,597	0	0	277,347.7	22	1,939	0.0	0	0
80 - 85	1,069.3	0	0	-15,138,071	0	0	294,682.0	9	784	0.0	0	0
85 - 90	1,132.2	0	0	-16,028,546	0	0	312,016.2	2	196	0.0	0	0
90 - 95	1,195.1	0	0	-16,919,022	0	0	329,350.4	2	216	0.0	0	0
95 - 100	1,258.0	0	0	-17,809,496	0	0	346,684.7	7	640	0.0	0	0
Hours Off	0.0	0	0	0	0	403	0.0	0	0	0.0	0	8,760



JOB <u>Irwin EEAP - Ft. Riley, Ka</u>	ansas
SHEET NO.	_ OF
CALCULATED BY MM	DATE 4-1992
CHECKED BY RDF	DATE 4-1992
JOB NO5080	

MAINTENANCE EQUIVELENT FULL LOAD HOURS 250 TON CHILLER

% DESIGN	CAPACITY X	Hours +	TOTAL =	EFLH
	TONS		TONS	
5	62.9	4385	230	1199
10	125.8	0	230	0
15	188.7	405	230	332
20	251.6 (230)	3970	230	3970
TOTAL	·	•		5,501
	ALL REMAININ	G Houses		

500 TON CHILLER

% DESIGN	CAPACITY X	HOURS :	TOTAL =	EFLH
*****	TONS		TONS	
20	251.6-230	757	460	36
25	314.5-230	273	460	66
30	317.4-230	382	460	122
35	440-230	537	460	245
40	503-230	417	460	247
45	566.1-230	349	460	255
50	629 - 230	323	460	280
55	691.9-230 (460)	932	460	932
TOTAL		1		2,183
	ALL REMAINING HOUSE	25/		,

COST ESTIMATE ANALYSIS For use of this form, see TM 5-800-2; the proponent seemsy is USACE.	TE ANAL	YSIS	cy is USA	CE.	INVITAT	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE MARCH 1992	SICING D	ATE	DATE PREPARED MARCH 18. 1	1992	
PROJECT IRWIN ARMY COMMUNITY HOSPITAL	ITAL -	EEAP			CODE (Check one)	heck one)	۲	DRAWING NO.			SHEET	1	SHEETS
LOCATION FORT RILEY, KANSAS						OTHER	,	ESTIMATOR	WAB		CHECKED BY R. D. FRY	BY FRYMIRE	
	ΦΩΦ	QUANTITY			LABOR		EQI	EQUIPMENT	Σ	MATERIAL		5	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	MH UNIT	TOTAL	PRICE	COST	PRICE	COST	PAICE	COST	TOTAL	TIND	TOTAL
RECAP!													
SHEET 20F4						14650		8400		471900	494950		
SHEET 30F4						3950		1050		6500	11500		
SHEET 40F4						1000		4200		2001	_		
							1						
Sub Johal						25,600		13650		485400	524650		
SUB CONTRACTOR	OH 4	OH 4 P. C	10%								52465		
Sub total											S11 LLS		
PRIME CONTEACTOR	OH,	12%									69254		
-1	PROF	PROF & 150HO	3	80							46169		
CONSTRUCTION COST											855269		
•													
SIOH @ 690											41552		
TOTAL THIS SHEET											734090		
DA FORM 5418-R, Apr 85													

COST ESTIMATE ANALYSIS	E ANAL	YSIS			INVITAT	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	EO	
use of this for	; the propo	ment egen	KEY IN USA	CE.				MARCH 19	1992		MARCH 18,	1992	
PROJECT IRWIN ARMY COMMUNITY HOSPITAL	LTAL -	EEAP			CODE (Check one)	_	۲	DRAWING NO.			SHEET 2	9. 4	SHEETS
LOCATION FORT RILEY, KANSAS] [] []	,	ESTIMATOR	WAB		R. D. FRY	8Y FRYMIRE	
	ΔUΑ.	QUANTITY			LABOR		EQI	EQUIPMENT	Σ	MATERIAL		IS	SHIPPING
TASK DESCRIPTION	NO. OF	UNIT	TINO	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	TINO TA	TOTAL
OPTION No. 3													
FURMISH & INSTAIL	THE					•							
FOLLOWING:													
GAS ENGINE													
DRIVEN CHILLER													
" WITH HEAT RECOVERY	EEY												
250 TON	_	EA			52	5000,	4K	400, 1754	175%	17500, 184000.	184000.		
450 TON	_	EA			7	7000,	4	4000,	290K	4000, 290K 29000 30100,	30 000,		
Rumps	N	EA			500.	1000,	8	200,	35	(0000)	7200.		
+=		(1		1	,						
TOING, INCIDORS TANGERS, SHELDS	ANGE	5,53	925	-	SULA	TIOH .	CEU CEU	HSULATION - CHILLED WATER	ATER	•			
G" CHS&CWR 50		L			ū	750.	ci	8	7.	350.	1200.		
CHS & CLUE	20	17			18,	.900.	i	100.	=	550.	1550.		
					4.								
TOTAL THIS SHEET						14650.		8400.		471900,491450.	49450.		

FORT RILEY, KANSAS LOGATION TARK DESCRIPTION NOTE INVESTIGATION TARK DESCRIPTION NOTE INVESTIGATION NOTE INVESTIGATION LABOR LA	COST ESTIMATE ANALYSIS For use of this form, see TM \$400.2: the proponent seemey is USACE.	E ANALY	SIS	V le USA		TATIVNI	INVITATION/CONTRACTOR	TOR	EFFECTIVE PRICING DATE	RICING D	ATE	DATE PREPARED	1997	
COCATION COLON C	PROJECT IRWIN ARMY COMMUNITY HOSPI	TAL - E	EAP			CODE (C)	-	ام	DRAWING NO			SHEET 3) 10	1
Pipings "Includes Hangers" - Cohoemset " "	LOCATION FORT RILEY, KANSAS						, Ē	,	ESTIMATOR	WAB		CHECKED BY R. D. FRY	MIRE	
TARK OREGINTION MODE WINT WITH 1978 WINT TOTAL THE COST WINT TOTAL THE SHEET COST WINT TOTAL WINT TOTAL WINT TOTAL WINT TOTAL WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT TOTAL THE SHEET COST WINT THE SHEET COST WINT TOTAL THE		QUAN	П		٦	ABOR		EQ	JIPMENT	Σ	ATERIAL		8	HIPPING
PIPING: "Include's HANGERS" - CONORNSER WATER 6" CRECES 100 LF 2, 200, 7, 200, 4, 400, 10" " " 150 LF 5, 450 3, 450 4, 600, 10" " " 1 150 LF 5, 450 3, 450 4, 600, 2000 CATCOLS AND INCLUDE'S METERS WHIVES BECHLATORS & PIPE LS 100, 200, 11 100, 100, 100, 100, 100, 100, 100	TASK DESCRIPTION			UNIT	TOTAL	PRICE	COST	PRICE	COST	PRICE	COST	TOTAL	F FX	TOTAL
6" CRECES 100 LF 2, 200, 2, 200, 3, 300, 100 LF 2, 200, 2, 200, 4, 400, 100, 10, 11, 11, 150 LF 3, 450, 3, 450, 4, 600, 10, 10, 10, 10, 10, 10, 10, 10, 10,	"IHCLUDE	士	10E	E5.		100	HSER L	ATE	2	,				
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DA FORM SAIB-R, Apr 35													

	ANALYSIS PROGRAM (EEAP)
oroject number	program year
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permanent:	category code
oint of contact:	
name <u>Maj. James Fletcher</u>	date date 28 August 1991
titleChief of Logistics	phone (913) 239-7207
	autovon
fae Larry Stillwagon	date 20 August 1991
	phone (913) 239-2371
menase mergy willien	autovon
engineer district	date 28 August 1991
title Project Manager	phone (816) 426-2782
other (A.E.)	autovon
name Randall D. Frymire	date27 August 1991
titleProject Manager	phone (816) 931-2200
	autovon
wisewal base	
eviewed by: Installation facility engineer In name Larry Stillwagon	28 August 1991
	Odle
title Base Energy Officer	phone (913) 239-2371
	autovon
oproved by:	
name	date
title	phone
	autovon
	auwvii

project development brochure, PDB-1

facility

IRWIN ARMY COMMUNITY HOSPITAL FT. RILEY, KANSAS

project coordinator for using service

LARRY STILLWAGON
BASE ENERGY OFFICER

functional requirements summary, PDB-1

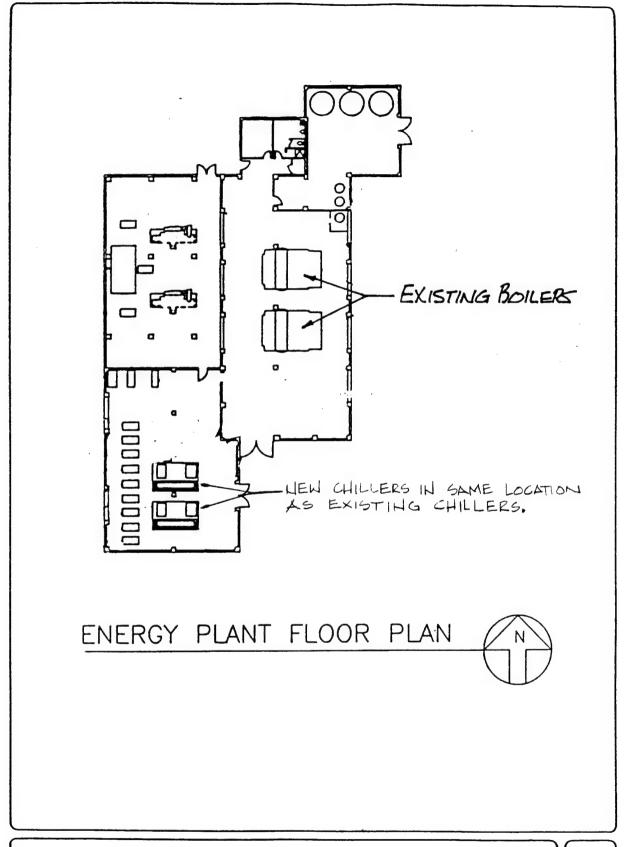
DA FORM 5020-1-R, Feb 82

OBJECTIVE

The objective of this project is to remove three 200 ton steam centrifugal chillers and replace them with one 250 ton and one 500 ton gas-fired engine-driven chillers in the hospital energy plant. The new units will provide base load cooling and greater efficiency in the off-peak season.

functional requirements summary, PDB-1

DA FORM 5020-2-R, Feb 82



facilities requirements sketch, PDB-1/2

DA FORM 5022-R, Feb 82

A. SPECIAL CONSIDERATIONS

	A. SPECIAL CONSIDERATIONS	ed or quired	• peri	ž p	d at
	ITEM	Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Cost estimates for each primary and supporting facility	B			V
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NR			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse cooordination, etc.)	NR			
A-4	Assignment of airspace	NC			1
A-5	Economic analysis of alternatives	NR	l		
A-6	Approval for new starts	NR			
A-7	International balance of payments (IBOP) coordination with U.S. European command and	1			
	NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	NR	1		
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state				
	historic preservation officer and advisory council on historic preservation	NR			
A-9	Exceptions to established criteria	NR			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	NR			
A-11	Identification of related or support projects (so projects can be coordinated)	HR			
A-12	Required completion date	NIZ NR			
			ı		

REQUIRED OR NOT REQUIRED - Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED - Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED - Significant information summarized or explained

DOCUMENT ATTACHED - Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E - Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-A-R, Feb 82

B. SITE DEVELOPMENT ITEM 8-1 Consultation with the District Office to determine and evaluate flood plain hazards B-2 Preparation, submission, and/or approval of new NR (A) (B) (C) Sketch Site Plan (0) Facilities Requirements Sketch NR B-3 Preparation of (A) Site Survey NB Subsoil information (B) NR B-4 Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan Other Site Development Considerations (List and number items)

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documentation checklist

DA FORM 5023-B-R, Feb 82

C. ARCHITECTURAL & STRUCTURAL

\equiv	ITEM	Require Not Rec	To Be Determ	Comme	Docum Attache
C-1	Reconciliation with troop housing programs and requirements	NR			
C-2	Evaluation of existing facilities (including degree of utilization)	NG			
C-3	Approval for removal and relocation of existing useable facilities	NE			
C4	Evaluation of off-post community facilities	NR			
C-5	Storage and maintenance facilities (including nuclear weapons)	NR			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	NR			
C-7	Coordination of aviation facilities with FAA	NR			
C-8	Coordination air traffic control and navigational aids with USACC	NB			
C-9	Tabulation of types and numbers of aircraft	NA			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	NK			
C-11	Coordination chapels with Chief of Chaplains	NE			
C-12	Review food service facilities by USATSA	NK			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NR			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NP.	<u> </u>		
C-15	Laundry and dry cleaning facilities coordination with ASD(1&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item 8-4)	NR			
C-18	Analysis of deficiencies	NR			
C-19	Consideration of alternatives	NR			
C-20	Determination whether occupants will Include physically handicapped or disabled persons	NE	ļ		
C-21	As-build drawings for alterations or additions	NE	ļ		
C-22	Availability of Standard Design or site adaptable designs	NR	.	·	
	Other Architectural & Structural (List and number items)				

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documentation checklist

DA FORM 5023-C-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

	ITEM	Required Not Req	To Be Determir	Commen	Documen
D-1	Fuel considerations and cost comparison analysis	NR			
D-2	Energy requirements appraisal (ERA)	NR			
D-3	Conformance with DOD Energy Reduction requirements	NR			
D-4	Evaluation of existing and/or proposed utility systems	NR			
		227 227			

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documentation checklist

DA FORM 5023-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

	ITEM	Required Not Requ	To Be Determin	Commen	Documer Attached	
E-1	Environmental impact assessment	NR	-			1
E-2	EIA conclusions require Environmental Impact Statement	NE				1
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)	78				
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level	NK				
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.	Ni-				
	Other environmental considerations (list and number items)	K.				

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E - Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-E-R, Feb 82

A. SPECIAL CONSIDERATIONS

	ITEM	Require Not Rec	To Be Determi	Comme	Docume
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	NE			
A-2	Construction phasing requirements	R	P		
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	NR			
A-4	Equipment in place and justification	NR			
A-5	Other equipment and furniture (O&MA, OPA) and costs	NR		<u> </u>	
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	NR	.		
A-7	Type of construction (permanent, temporary, semi-permanent)	NR			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	NI-			
	Other special considerations (list and number items)	NK			

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C - Construction Service

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E — Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-A-R, Feb 82

B. SITE DEVELOPMENT

	ITEM	Required Not Requ	To Be Determin	Commen Attached	Documer Attached
B-1 (A)	Construction restrictions or guidelines pertaining to site access and preferred construction routes	NR			
(B)	Airfield clearance, explosive storage, working hours, safety, etc.	NI-	L		L
(c)	Facilities and/or functions or adjoining areas (structures, materials, impact)	14			
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)	NG			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/ chemical contamination/asbestos emissions/toxic gases	NR_			
(8)	Restrictions on disposal of demolished/relocated material including hazardous waste	NR			
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NR			-
8-5	Landscape considerations				
(A)	Protection of existing vegetation	NR	ļ		
(8)	Stockpile topsoil	NR			
	Other Site Development (List and number items)	2			

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- E Other (Check Comments Attached and explain)

technical data checklist

C. ARCHITECTURAL & STRUCTURAL

	ITEM	Required Not Requ	To Be Determine	Comment Attached	Document Attached
C-1	Vibration-producing equipment requiring isolation	R	0		
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	R	D		
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)	NE	-		
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	NR			
C-5	Designation and strength of units to be accommodated	NR			
C-6	Requirements and data for special design projects	NR			
C-7	Unusual floor and roof loads (safes, equipment)	1.0			
C-8	Security features (arms rooms, vaults, interior secure areas)	NE			
	Other Architectural & Structural (List and number items)	777			

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technical data checklist

DA FORM 5024-C-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

		per	i i	hed	ned:
	ITEM	Required	To Be Determine	Comment Attached	Documen Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	NY	3		
0-2	Special peak usage periods and peak leveling techniques	71		<u> </u>	
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	R	D		
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	5	0		
0-5	Heating—availability, general system type and characteristics (proposed and/or existing)	17	2		
0-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	7			
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	12	0		
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	NR			
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	8	D		
0-10	Solar energy evaluation	7			
	Other Mechanical & Utility Systems (List and number items)	7			
	i				

- REQUIRED OR NOT REQUIRED Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.
- TO BE DETERMINED Information needed but not currently evailable. Enter code for information source.
- COMMENT ATTACHED Significant information summarized or explained and attached.
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- *BY WHOM (Check and insert appropriate letter)
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technical data checklist

DA FORM 5024-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS To Be * Determined Comment Attached ITEM Waste water treatment, air quality, and solid waste disposal criteria Other Environmental Considerations (List and number items)

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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technical data checklist

DA FORM 5024-E-R, Feb 82

Required or Not Required F. FIRE PROTECTION ITEM Special fire protection systems or features (detection and suppression equipment, hazards, etc.) NR Other Fire Protection Considerations (List and number items)

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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technical data checklist

DA FORM 5024-F-R, Feb 82

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DA FORM 5418-R, Apr 85

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DA FORM 5418-R, Apr 85